HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

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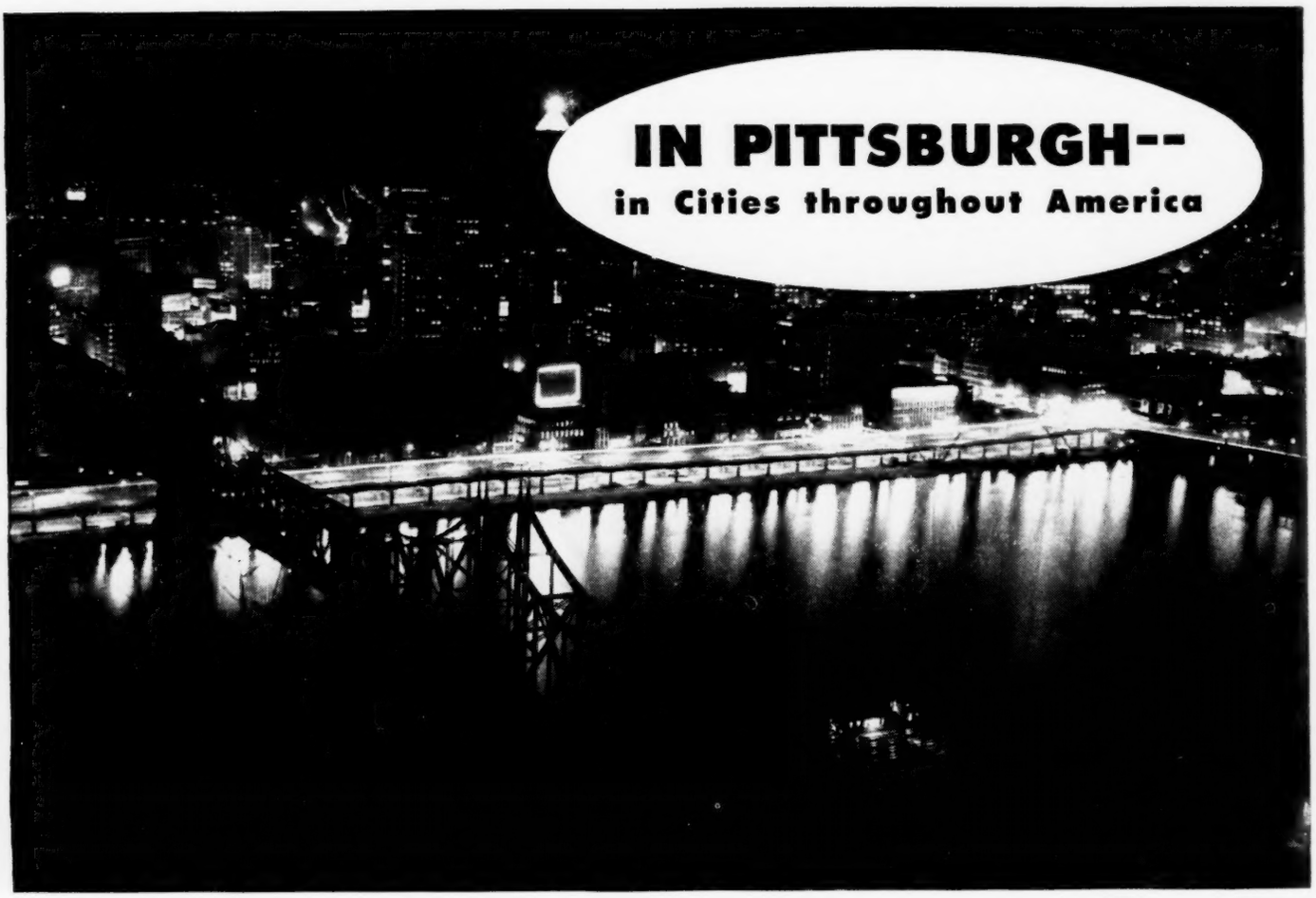
PUBLISHERS OF MACHINERY & MACHINERY'S HANDBOOK
The INDUSTRIAL PRESS

THIS MONTH'S COVER

Air conditioning units serving Douglas Aircraft Co., Inc.'s windowless plant at Oklahoma City are all located on platforms above the trusses. They are accessible from catwalks extending the full length of the plant. Photo, courtesy The Austin Co.



Wagner *Quality* Motors help control the "weather"

Countless Wagner Motors are on the job, day and night—summer and winter—to help people work and play in year 'round comfort. The rapidly growing business of controlling the "weather" through air-conditioning, heating, and ventilating has created a demand for motors that provide quiet, troublefree, *dependable* power. Wagner Engineers have met this demand and Wagner Motors have played an important part in the development of this tremendous industry.

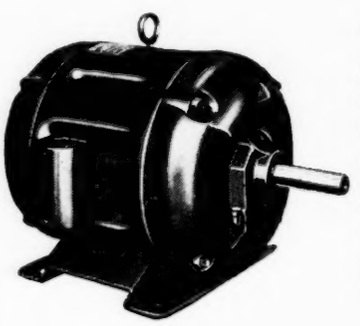
Wagner builds motors in types and sizes for a wide range of applications. Maximum service at low cost has made Wagner Quality Motors famous for over 50 years. Whatever your job, a Wagner Motor will handle it efficiently and economically. Quick, convenient, nationwide service facilities are available to users of Wagner Motors.

Ask any of our twenty-nine branch offices, located in principal cities and manned by versatile field engineers, for advice on any motor application.

Write for Bulletin MU-185 for information on the complete line of Wagner Motors.

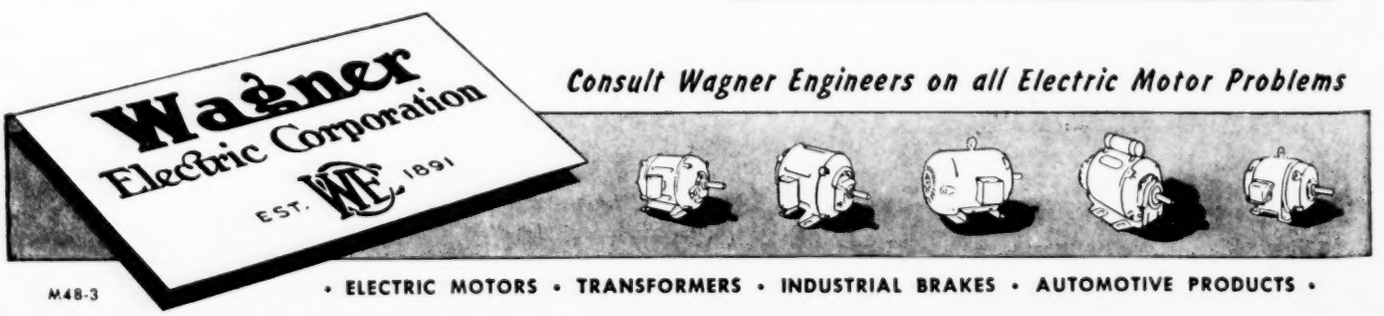
Wagner Electric Corporation

6463 PLYMOUTH AVE., ST. LOUIS 14, MO., U. S. A.



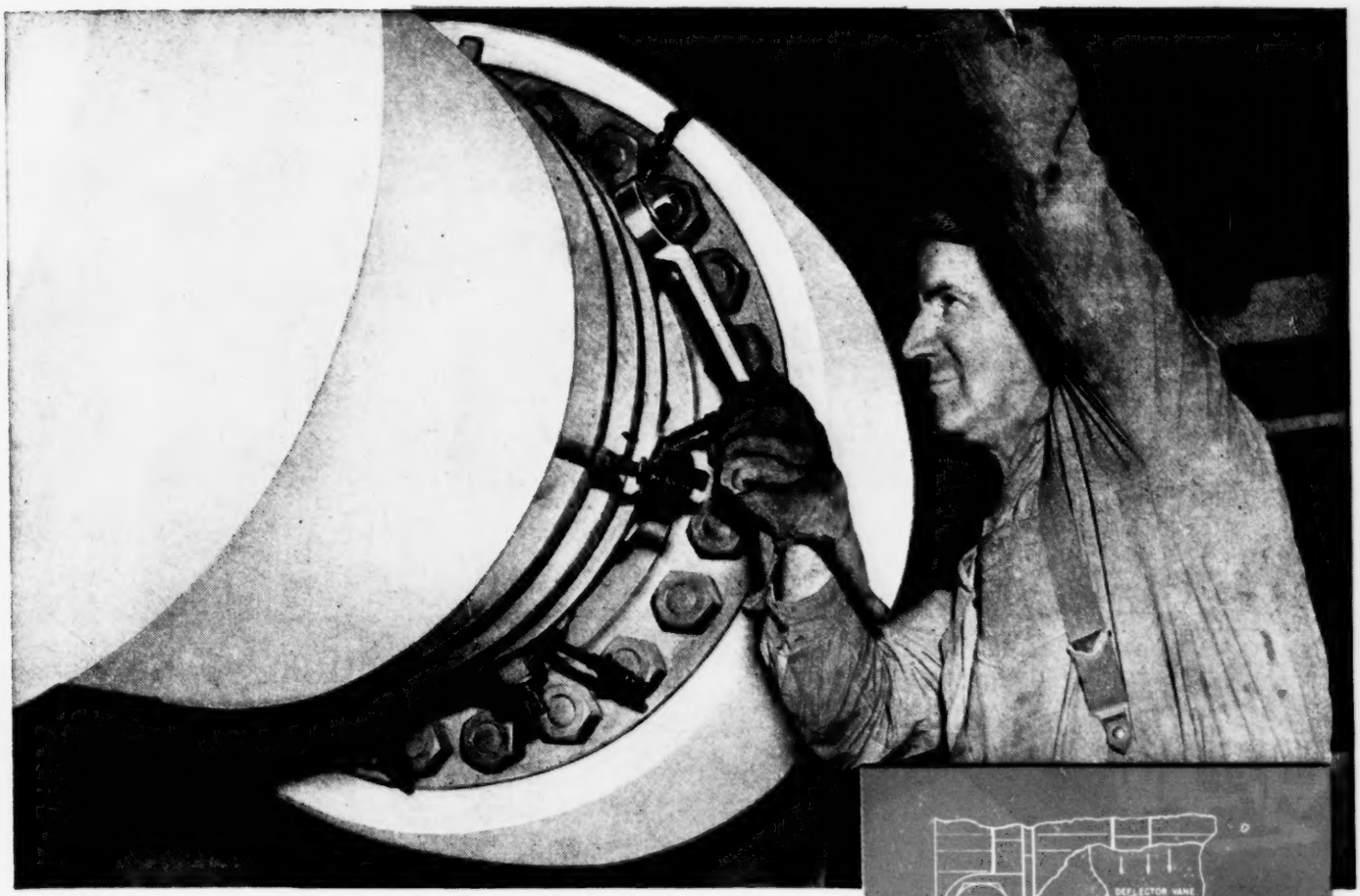
Regardless of what your motor requirements may be—large motors... small motors... Wagner makes them all. The motor illustrated is typical of the Wagner line of polyphase and single phase motors. Choose a Wagner motor for your next installation.

Consult Wagner Engineers on all Electric Motor Problems



M48-3

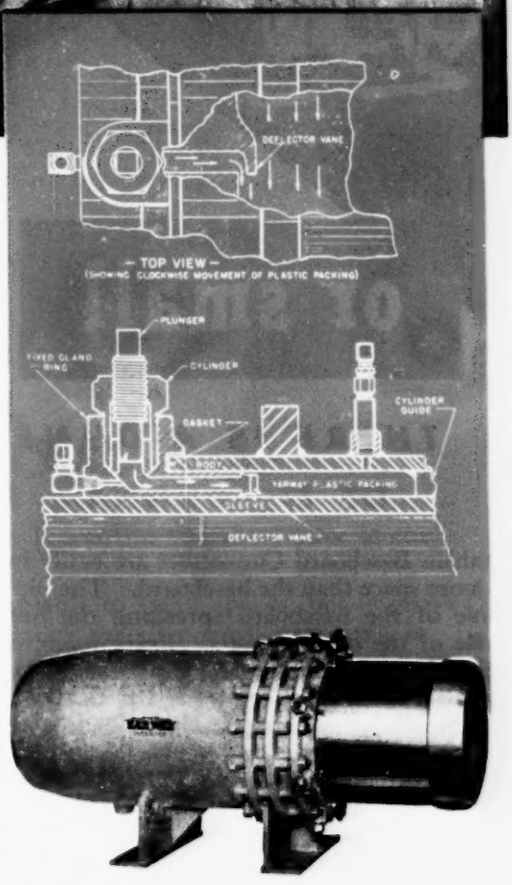
• ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE PRODUCTS •



Servicing

A YARWAY GUN-PAKT JOINT

Under Full Steam Pressure



No need for costly shutdowns to repack slip-joints any more. The Yarway Gun-Pakt Expansion Joint never needs unpacking . . . is kept tight by occasionally adding packing with the joint under full steam pressure. It has been called "the greatest expansion joint improvement of modern times."

To add packing, simply insert slug of special Yarway semi-plastic packing into Gun-Pakt fittings of gland ring on joint. A twist of a wrench forces packing into stuffing box. New packing rejuvenates the old. The joint's tight . . . the job's done!

Users report tremendous savings in time, trouble, money and hard labor when they use Yarway Gun-Pakt Expansion Joints. Thousands are in service in leading industrial plants, utilities, institutions and public works.

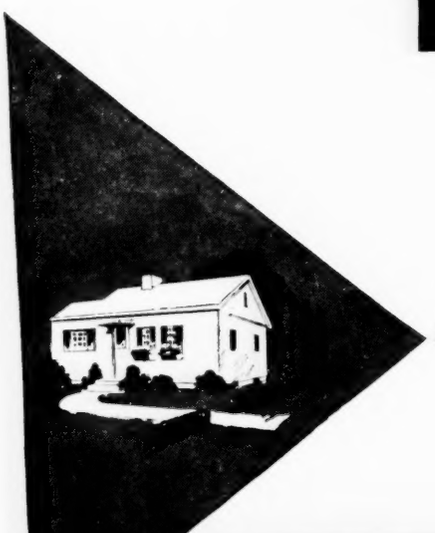
For the full story on Yarway Gun-Pakt Expansion Joints, write for Bulletin EJ-1911.

YARNALL-WARING COMPANY, 104 Mermaid Ave., Phila. 18, Pa.

Ask about the Yarway 30-minute color and sound motion picture, with Lowell Thomas speaking—available for group showings.

YARWAY GUN-PAKT EXPANSION JOINT

no matter how large or small the installation



THERE IS A DUNHAM SYSTEM TO TAKE CARE OF IT—DUNHAM PRODUCTS TO MAINTAIN IT!

Dunham Baseboard Convectors are easily installed, take no more space than the baseboard. The piping is on the inside of the baseboard spreading the heat along the inside of the outside walls. Every room, every corner; even the floors in houses built without basements, are assured of comfortable temperatures. Finned radiation concealed behind the attractive baseboard with concealed louvers, is engineered to keep walls clean and decorating costs to a minimum. The Dunham Baseboard method of heating provides a blanket of warmth for the home using either hot water or steam. Bulletin 639H with complete details will be sent on request—C. A. Dunham Company, 400 W. Madison Street, Chicago 6, Ill.

The Dunham Differential Vacuum Heating System has the important advantage of *sure immediate* and *automatic* control or room temperature under all weather conditions including sudden and extreme changes. This system, circulating sub-atmospheric steam, has established both tenant satisfaction and reduced heating and maintenance costs in hospitals, hotels, large apartment projects, office and industrial buildings. Fuel savings from 33% and more are commonplace. Write for Bulletin 631H and get the complete story on satisfactory, trouble-free Differential Heating—C. A. Dunham Company, 400 W. Madison Street, Chicago 6, Ill.

DUNHAM PRODUCTS ENGINEERED TO GIVE EFFICIENT, LOW MAINTAINENCE PERFORMANCE.

BASEBOARD CONVECTORS • CONVECTORS • FLOAT & THERMOSTATIC TRAPS • HIGH PRESSURE STEAM TRAPS • HEATING & VENTILATING UNIT ONE TUBE HEATING ELEMENT • PUMPS • PACKLESS RADIATOR VALVES THERMOSTATIC RADIATOR TRAPS • UNIT HEATERS DIFFERENTIAL VACUUM STEAM HEATING SYSTEMS

DUNHAM

HEATING MEANS BETTER HEATING

NOW!

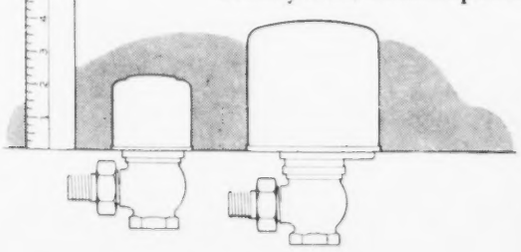
ONE FOURTH SIZE ....but EQUAL CAPACITY

the *NEW* Honeywell Full Modulating Radiator Valve

So small it mounts easily within convectors, you'll want to switch at once to the new Honeywell V0501 radiator valve for installations.

You get not only a trim, inconspicuous valve adaptable to small spaces, but improved performance as well. This new "half-pint," with capacity for all normal pressures, is fully modulating—seeks any position as required—and is available with a full range of port sizes to fit all radiation capacities. Design improvements eliminate frequent adjustments and include such practical features as tamper-proof cover and packing replacement without system shut-down.

Most important, remember that a truly small valve is now available—just *one-fourth* the size of previous radiator valves—an engineering achievement of which we are proud. And the Honeywell name is your assurance of long-lived, dependable performance. Phone or write your nearby Honeywell branch today for complete specifications. Minneapolis-Honeywell, Minneapolis 8, Minnesota. In Canada: Toronto 12, Ontario.

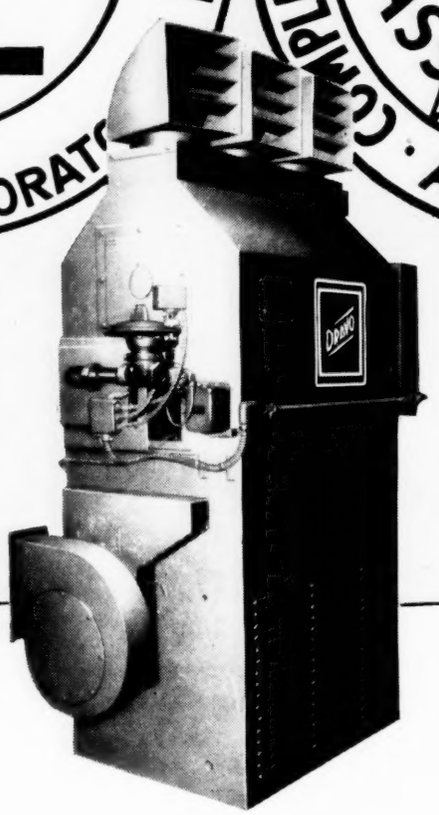


MINNEAPOLIS Honeywell
CONTROL SYSTEMS

LISTED—APPROVED

LISTED UNDER REEXAMINATION SERVICE UL UNDERWRITERS' LABORATORIES OF INC.

COMPLIES WITH NATIONAL SAFETY REQUIREMENTS · AMERICAN GAS ASSOCIATION · APPROVED ·



NOW—two famous laboratories have tested the Dravo *Counterflo* Heater and found it to be constructed in accordance with their standards. Effective immediately all standard gas-fired Dravo *Counterflo* Heaters will bear the American Gas Association and Underwriters' Laboratories, Inc., marker indicating approval and listing, respectively. In addition all standard oil fired Dravo *Counterflo* Heaters are listed by Underwriters' Laboratories, Inc.

For additional information regarding sizes, efficiencies, specifications, etc., write Dravo Corporation, Heating Section, Dravo Building, Pittsburgh 22, Pa. Ask for bulletin GG-516.

DRAVO CORPORATION

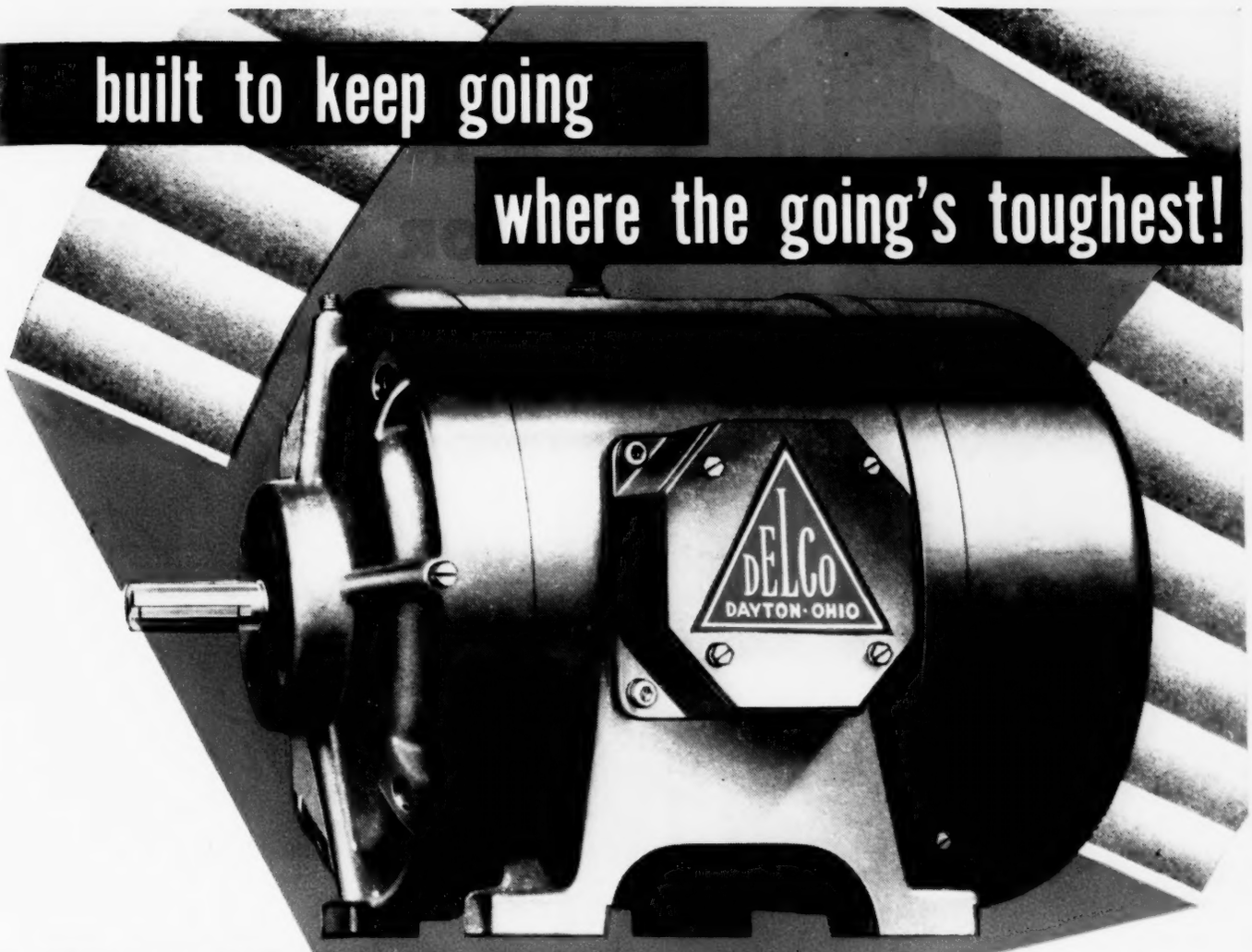
PITTSBURGH · PHILADELPHIA · CLEVELAND · NEW YORK · CHICAGO · DETROIT · ATLANTA

Sales Representatives in Principal Cities

DRAVO

built to keep going

where the going's toughest!



THE NEW DELCO MOTOR

Sand, scale, dirt and dust in the air? Forget it! Completely protected by its totally enclosed, double-shell frame, this great new Delco Motor takes all these in its stride.

Everything about the new Delco Motor promises a superior kind of steady, cool-running performance. New materials and new design practices make it more rugged, better ventilated and insulated. New simplicity and accessibility make maintenance a much less frequent and less costly process.

Put this really *new* motor to work in foundry, factory, mill or forge plant—*anywhere* conditions are tough—and watch it prove its outstanding value! Write for complete data.

CHECK THESE FEATURES OF THE NEW DELCO MOTOR

- Totally enclosed; fan-cooled.
- Individually taped coils.
- Thoroughly insulated windings.
- Unit-cast, ball-bearing rotor, dynamically balanced; parts interchangeable end to end.
- Double-shell frame with new simplified cooling system.
- Extra-large, watertight conduit box; usable in four 90-degree positions.
- Extended, accessible mounting feet, cast as a unit with main frame.
- From 1½ h.p. through 50 h.p.; NEMA frame sizes, 224 through 505.

DELCO MOTORS

DIVISION OF GENERAL DELCO PRODUCTS DAYTON, OHIO MOTORS CORPORATION

SOLID COMFORT IN SUMMER FOR THE PAST TEN YEARS—

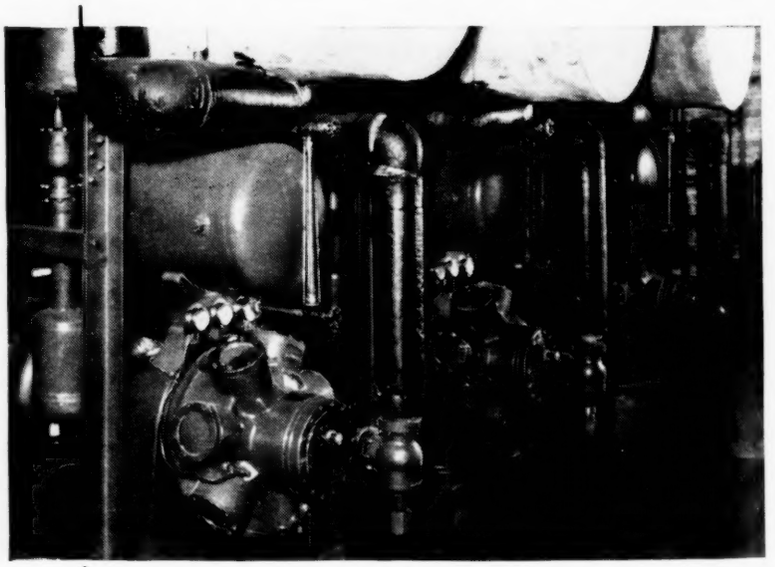
with Chrysler Airtemp Air Conditioning!

• People on all 14 floors of the Stuart Building, in Lincoln, Nebraska, are kept in cool comfort all Summer long with six Chrysler Airtemp condensing units totaling 450 horsepower.

"Exemplary performance in every way."

That, in a nutshell, is the story of how well Chrysler Airtemp has performed on this tough job of cooling. The system was installed in 1937 and has given top efficiency ever since!

Perhaps you, too, have an air conditioning problem. There's a Chrysler Airtemp installation to meet it. And *now* is the time to start thinking about solving next Summer's heat. Call your local Chrysler Airtemp dealer or write direct.



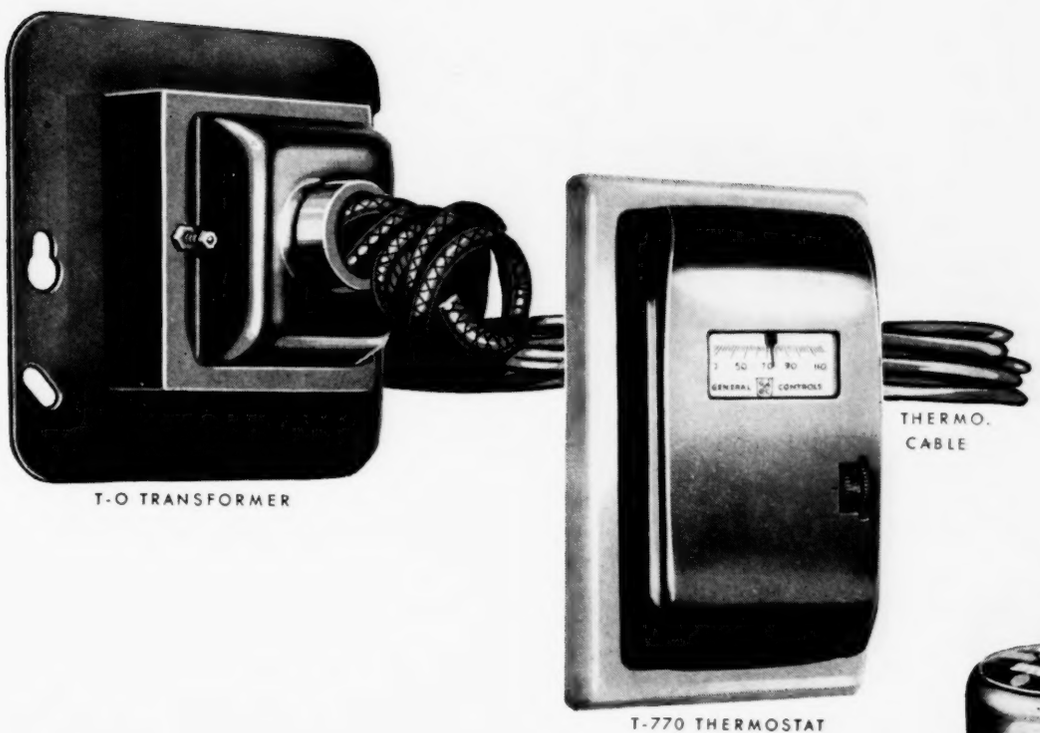
Airtemp Division of Chrysler Corporation, Dayton 1, Ohio
In Canada: Therm-O-Rite Products, Ltd., Toronto

Automatically Yours—

CHRYSLER AIRTEMP
DIVISION OF CHRYSLER CORPORATION

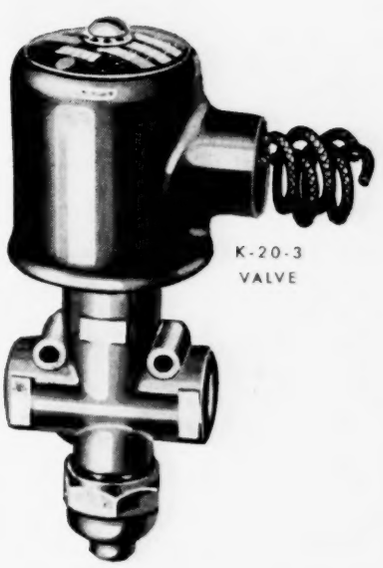
HEATING
AIR CONDITIONING
COMMERCIAL REFRIGERATION

T-23 OIL HEATING PACKAGE SET



T-O TRANSFORMER

T-770 THERMOSTAT



K-20-3
VALVE

Automatically Yours For Better Temperature Control

GENERAL CONTROLS

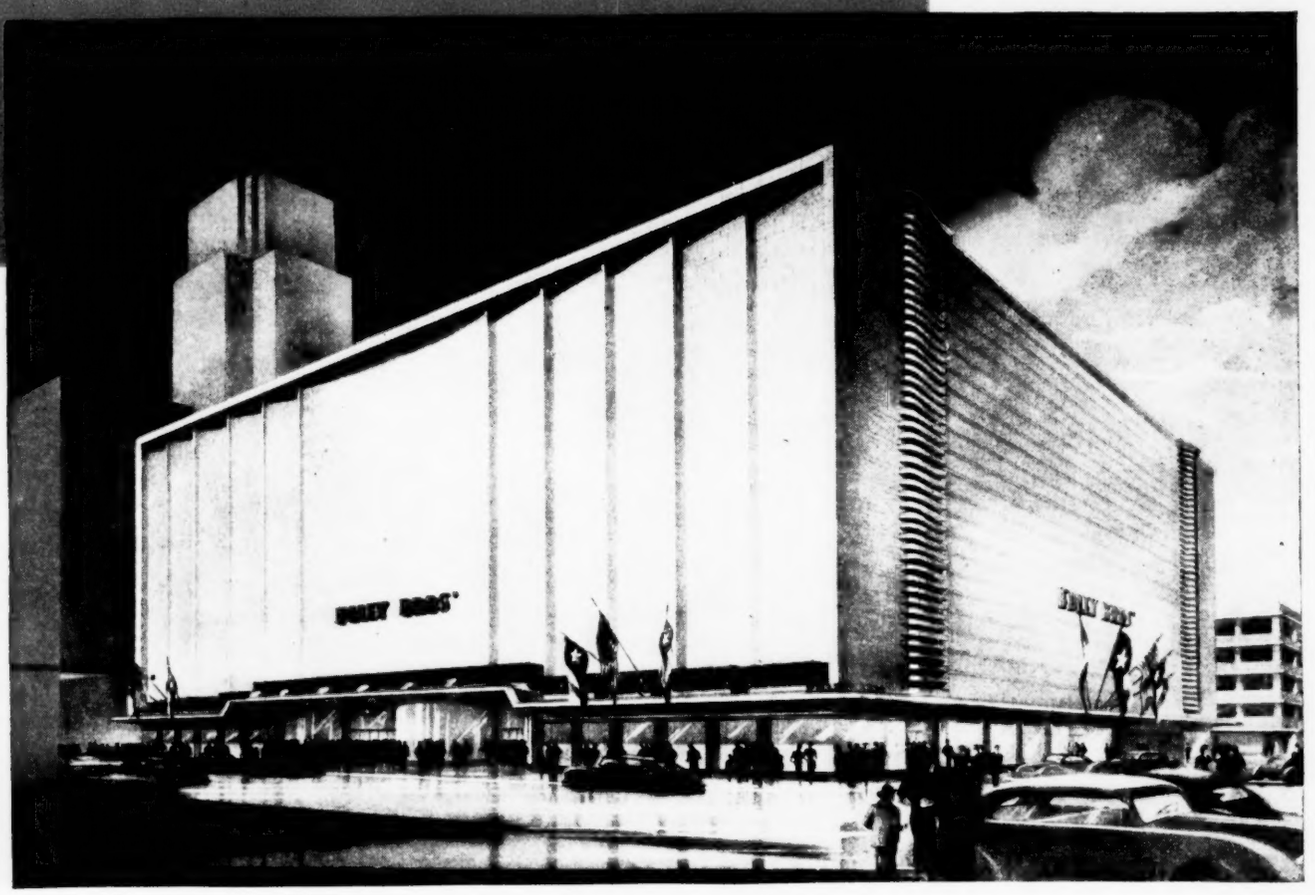
801 ALLEN AVENUE GLENDALE 1, CALIF.

Manufacturers of Automatic Pressure Temperature & Flow Controls

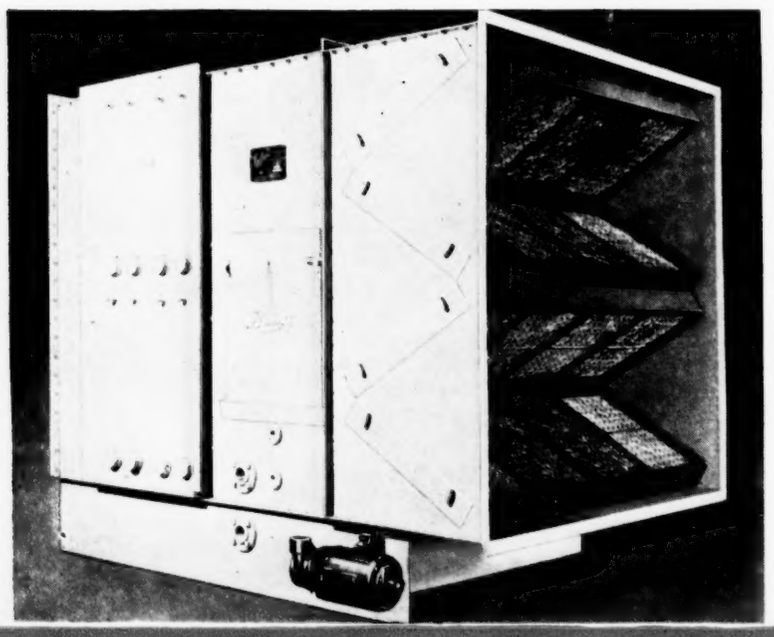
FACTORY BRANCHES: BIRMINGHAM (3) BOSTON (16) CHICAGO (5) CLEVELAND (15) DALLAS (2) DENVER (10) DETROIT (8) HOUSTON (2) KANSAS CITY (2) NEW YORK (17) PHILADELPHIA (40) PITTSBURGH (22) SAN FRANCISCO (7) SEATTLE (1) + **DISTRIBUTORS IN PRINCIPAL CITIES**

WRITE FOR FREE DESCRIPTIVE LITERATURE

Air Comfort *as a* Profit Force



Kenneth Franzheim, Houston, Architect; Raymond Loewy Associates, N. Y., Designers; Edward E. Ashley, N. Y., Consulting Engineer; Frank Messer & Sons, Inc., Cincinnati, General Contractors; Straus-Frank Co., Houston, Air Conditioning Contractors.



● Continuous bath for your air! "Buffalo" PCLW Air Washers draw dust-laden air through dense curtains of atomized water — through "scrubbing" plates — deliver it dust-free and properly humidified!

AGGRESSIVE, heads-up merchandising DEMANDS comfort conditioning for customers!

Successful store management is keenly aware of this profit-making public relations factor. Witness the great new *Foley's Store* in Houston, shown here. Air conditioned throughout by "Buffalo" equipment, this immense and extremely modern store offers comfort, convenience and value which stamps *Foley's* as a leader in its field.

Buffalo Air Conditioning Equipment is available with standard coils for combinations of cooling, dehumidifying, heating and humidifying and year-round cleaning. It is easily installed — processes MORE AIR for your fan and pump power — requires little attention — is built for DECADES of continuous service.

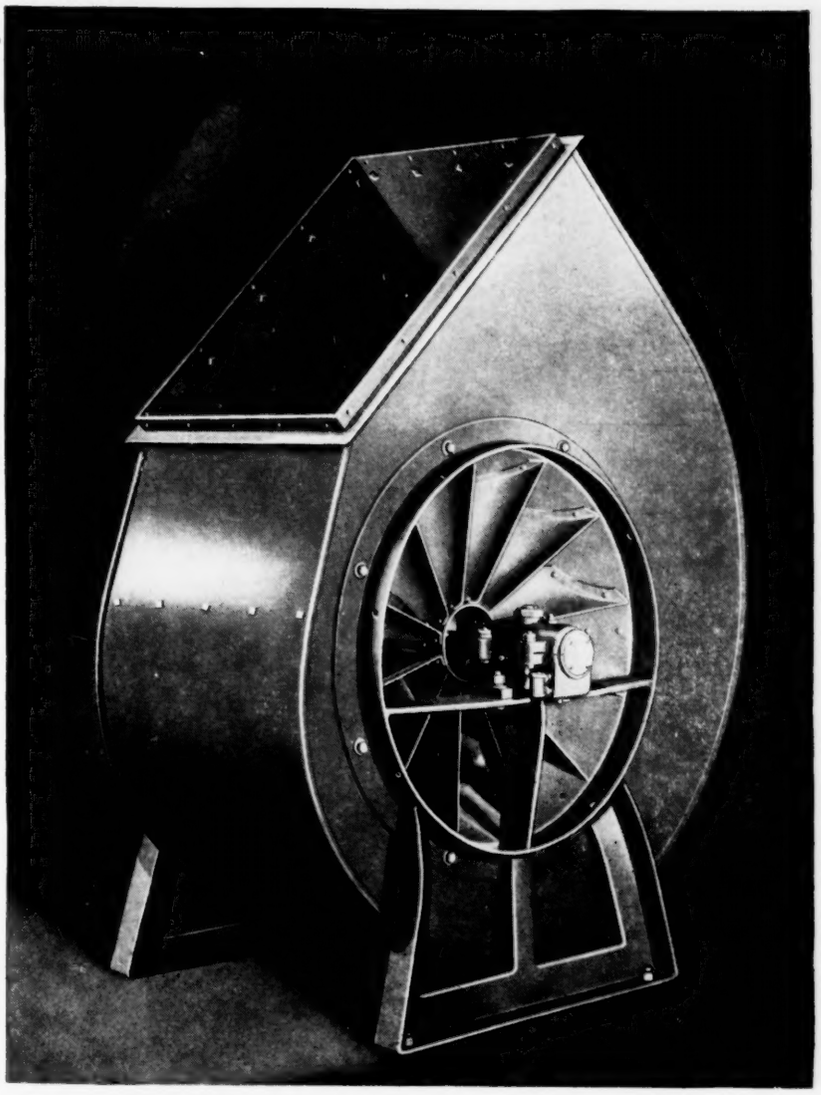
There is a "Buffalo" representative near you who can give you full details on Buffalo air comfort that aids store sales. Or simply write us.

BUFFALO FORGE COMPANY

480 Broadway, Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

● Buffalo "LL" Fans are quiet, efficient, durable. They are non-overloading, so that motors will not burn-out under any delivery condition.



"Buffalo"

AIR CONDITIONING EQUIPMENT

Slowly revolving outlets distribute the heated air continuously downward in a constantly changing direction, completely and thoroughly covering the working area

Write for details

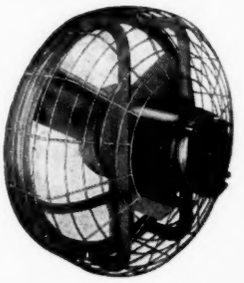
L. J. Wing Mfg. Co.

154 W. 14th Street

New York 11, N. Y.

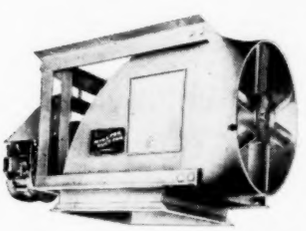
Factories: Newark, N. J. and Montreal, Canada

WING VENTILATING EQUIPMENT



WINGFOIL SAFETY VENTILATING FAN

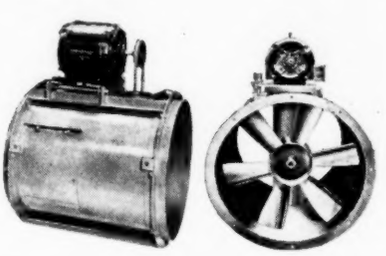
Distinguished for efficiency and rugged construction. The new Wingfoil fan wheel moves maximum volumes of air with minimum horsepower, due largely to its non-overloading features. Sizes from 10" to 60" dia., with free air capacities from 860 to 58,000 CFM. Larger sizes on special order. Either direct or belt drive. Heavy steel guards provide safety.



WINGFOIL DUCT FAN

(Elbow Type)

Designed to form an elbow in the duct system, the elbow-shaped housing in a strong rectangular frame permits installation with the inlet in any desired position. Motor and drive are outside the air stream, therefore remain cool, clean, and easily accessible. The new Wingfoil Fan has a remarkable "non-overloading" characteristic. Sizes 10" to 60"; capacities up to 60,000 CFM.



WINGFOIL DUCT FAN

(Straight Line Type)

Designed to form a part of any straight run of duct. The motor is mounted on an adjustable base outside of the housing. V-belt drive is through an air tube carried across the housing and supporting fan shaft and bearings. Fan wheel is the new, non-overloading Wingfoil Fan. Bearings are grease-sealed, requiring minimum of attention.

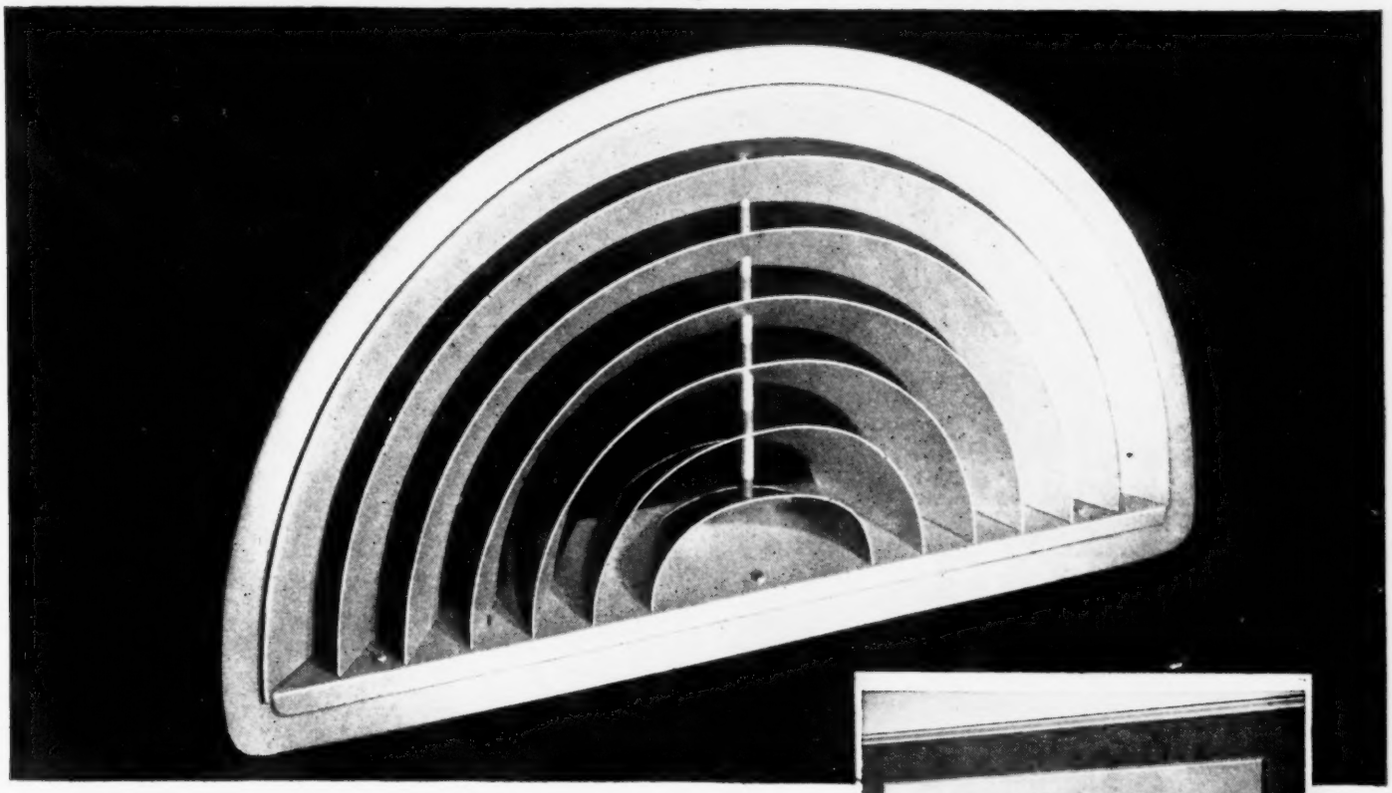
WRITE FOR BULLETINS

NO OTHER

Wall Type Air Diffuser

GIVES THESE RESULTS

- *No drafts... no stale air pockets*
- *Prompt equalization of room temperature and humidity*
- *Effective diffusion over an area of 180°*
- *Comfortable air motion*
- *Handles any specified number of air changes*



WALL ANEMOSTAT WITH ADAPTER PLATE

Frequently in either existing or new air conditioning systems, air supply outlets must be located on walls rather than ceilings. This introduces serious air distribution problems which can then be solved by installing wall-type Anemostat air diffusers . . . for only Anemostat offers a method of air distribution which produces draftless comfort under these circumstances.

Anemostats provide proper air diffusion in over 100,000 air conditioning, heating and ventilating installations. Without exception, owners enthusiastically report complete satisfaction.

Plan for Anemostats in new systems. Use them to correct systems that do not provide satisfactory comfort conditions. Our engineers will gladly assist you.

ANEMOSTAT

REG. U. S. PAT. OFF.

DRAFTLESS AIR-DIFFUSERS

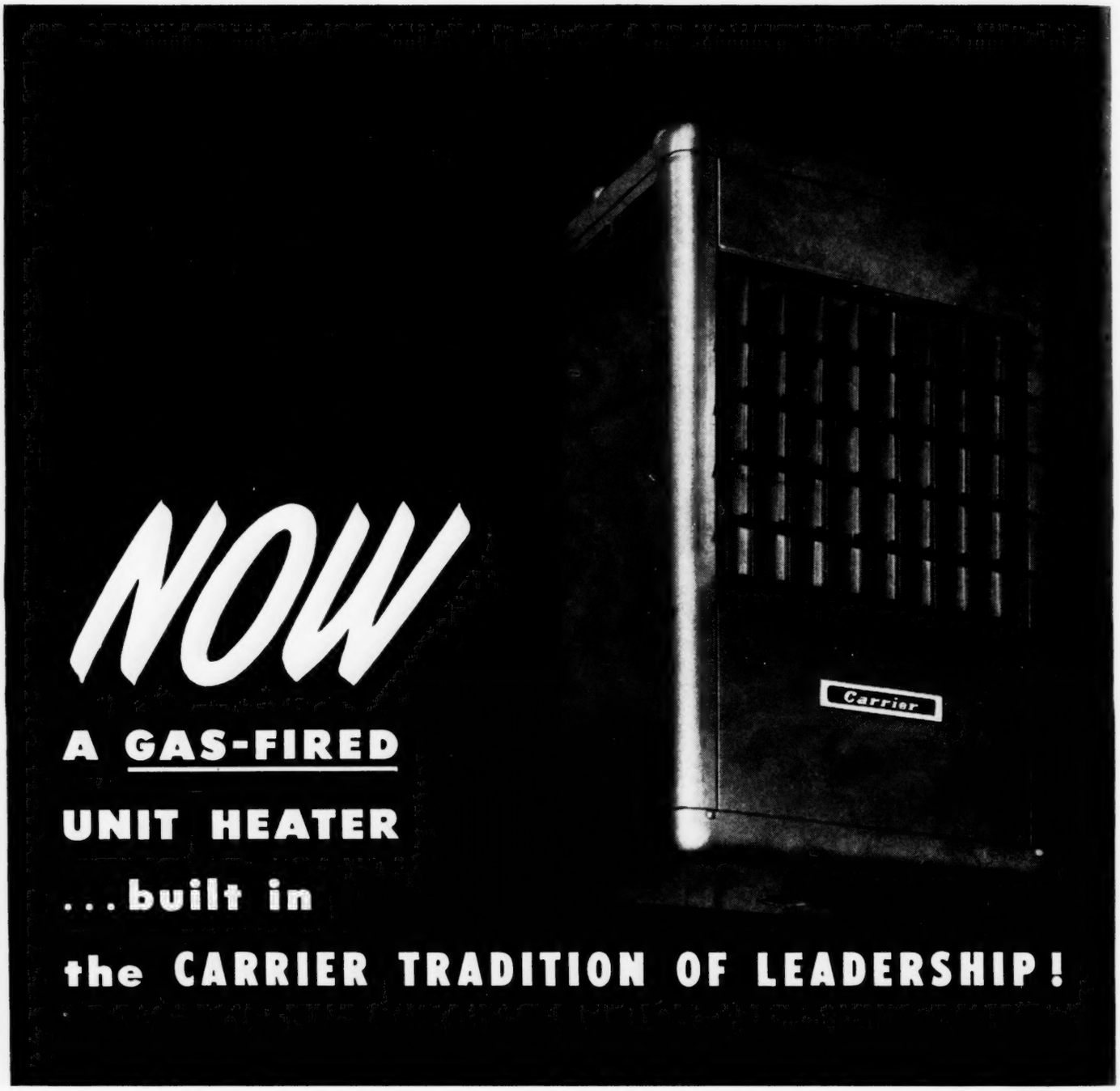
ANEMOSTAT CORPORATION OF AMERICA
10 EAST 39th STREET, NEW YORK 16, N. Y.
REPRESENTATIVES IN PRINCIPAL CITIES

AC-1191

How Anemostats Work

The principle employed in handling air through the Type "W" Wall Anemostat is the creation of a multiplicity of air currents traveling in layers or blankets at a variety of angles to each other, together with the creation of a multiplicity of counter-currents, and the creation of an aspiration effect by which 35% of room air is drawn into the device where the room air mixes with the cooled or heated air before the primary supply air is discharged.

"No air conditioning system is better than its air distribution"



Here's the latest in Carrier's famous line of space heaters—a new, completely automatic gas-fired unit heater.

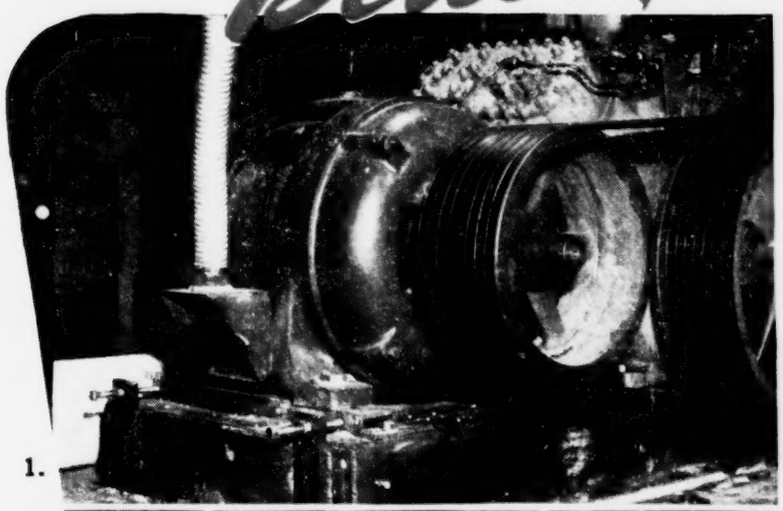
It's designed to provide quick, abundant heat for stores, shops, warehouses, factories, garages—any large space that requires a good volume of even heat. Adjustable louvres direct the heat to spots that need it most. The handsome, streamlined styling of the heater blends with any interior.

The heart of the unit—the fire-box and heat exchanger—is made of heavy-gage Aluminized steel, permanently bonded. It resists rust and corrosion. This leak-tight heat exchanger assembly is completely electric welded with no tie-bolts to freeze fast or gasket joints to dry out and leak. Draft-diverter is built-in and the flue connection is located at rear of cabinet.

The new Carrier gas-fired unit is designed and built with the same skill that has made other Carrier unit heaters and heat diffusers favorites with trade and industry. Carrier's unrivaled engineering skill and world-wide experience are *extra* values you get with these new tested heaters. Carrier Corporation, Syracuse, N. Y.

Carrier AIR CONDITIONING • REFRIGERATION • INDUSTRIAL HEATING

Properly Selected CENTURY MOTOR Assures *Better Performance*



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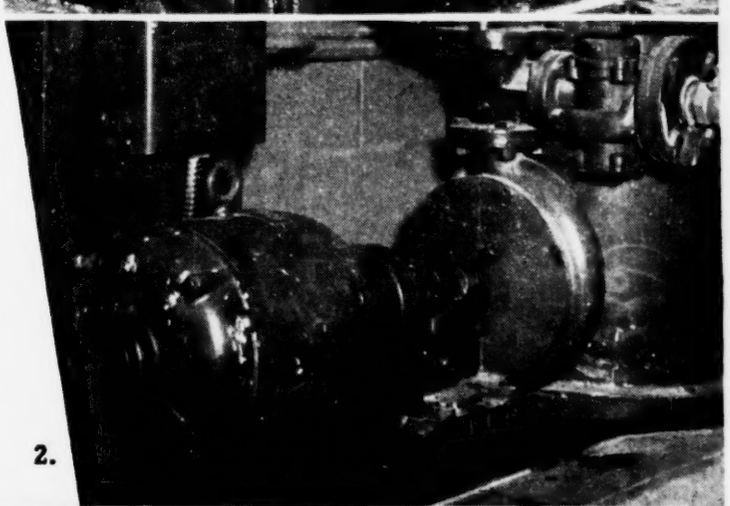

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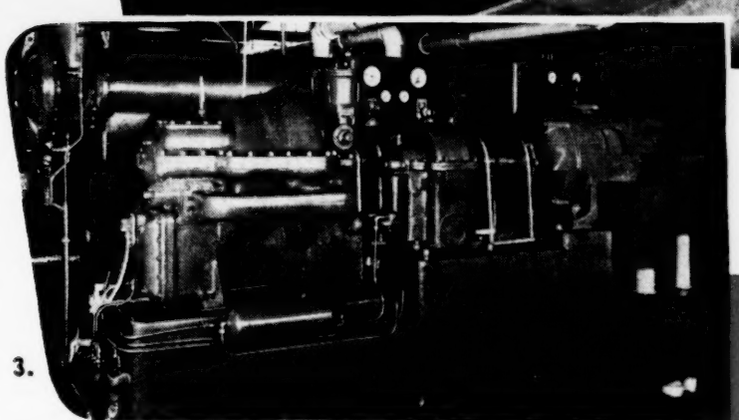


3.

There's a Century motor with the right electrical characteristics for all popular refrigeration, pumping, and air circulating applications.

Among their advantages are: the right starting torque, unusual freedom from mechanical and electrical vibration, rigid construction, adequate ventilation system, accurate machining and long life bearings.

Century motors for the heating, ventilating and air conditioning industry help to build customer satisfaction because they operate smoothly and quietly throughout their long life.

Century builds a wide range of motor types in sizes from 1 6 to 400 horsepower to assure top performance for every electric power application.

Specify Century for all your electric power requirements.

CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

1. Century 75 horsepower Type SCH squirrel cage motor provides the necessary high torque to start this reciprocating compressor without overmotoring.

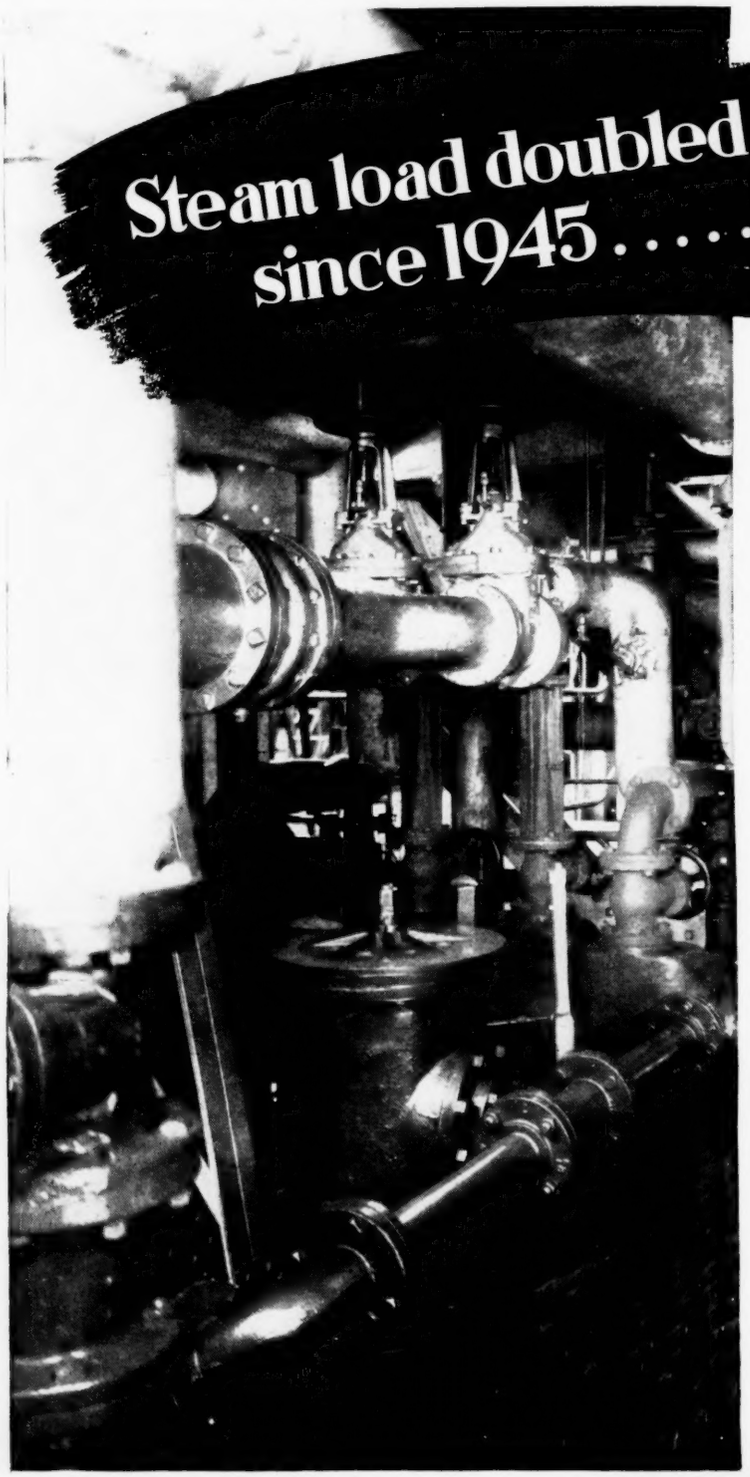
2. Century 5 horsepower Type SC squirrel cage motor provides smooth quiet power for this vacuum feed pump.

3. Century 200 horsepower Type SR slip ring motor driving a compressor.

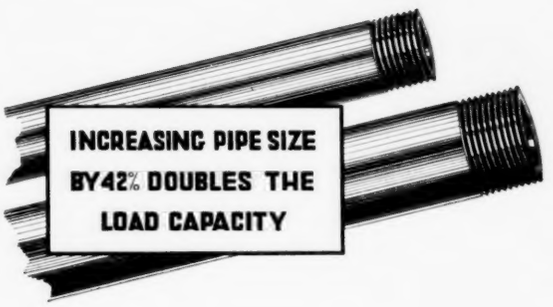
The high starting torque brings the compressor up to speed quickly and smoothly. The gear box increases the speed to 9,000 RPM.

575

INSTALL STEEL PIPING ADEQUATE FOR TOMORROW'S NEEDS



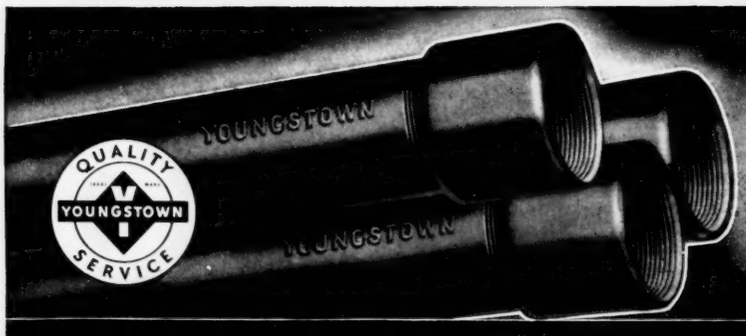
Steam load doubled since 1945 . . . . . "oversize" piping is still adequate



YOU'D think doubling the load would call for extensive--and expensive --plant alterations, including replacement of pipe, valves, fittings, etc. But this was an engineer gifted with foresight. In the reconversion of 1945, he "oversized" his pipe all the way along, 40% to 50% bigger than "will do." He was preparing for what did happen.

Of course, there is a point in this for today's construction work: Looking ahead, with steadily increasing loads very much in prospect, isn't it cheaper and smarter to pay extra and put in, for example, a 3-inch steel pipe instead of two-inch today, rather than figure on getting by with two-inch now and when necessary, rip it out to install 3-inch in a couple of years?

A few dollars' worth of foresight today is worth more than a fortune in hindsight tomorrow--especially when it comes to anything so permanent as good steel pipe.



YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

GENERAL OFFICES - YOUNGSTOWN 1, OHIO

Export Offices - 500 Fifth Avenue, New York City

Manufacturers of

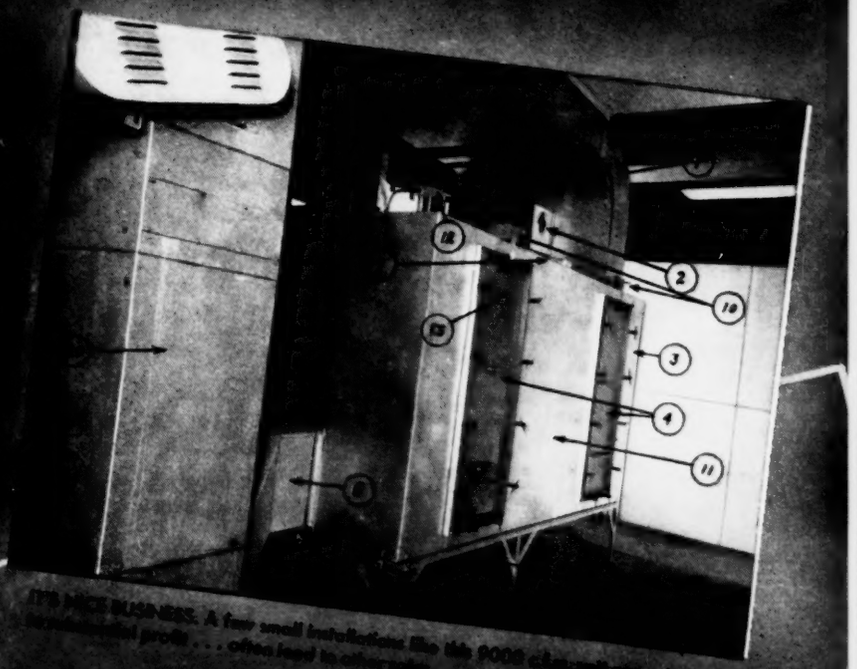
CARBON - ALLOY AND YOLOY STEELS

Pipe and Tubular Products - Sheets - Plates - Electrolytic Tin Plate - Coke Tin Plate.

Conduit - Bars - Rods - Wire - Cold Drawn Carbon Steel Rounds - Tie Plates and Spikes.

The RAYTHEON PRECIPITATOR

ELECTRONIC AIR CLEANING



IT'S NICE BUSINESS. A few small installations like this 9000 c.f.m. unit can add up to substantial profit . . . often lead to other sales.

RAYTHEON

These Are the Ingredients of TRANE Heating and Air Conditioning

Trane heating and air conditioning systems perform many functions . . . from dehydrating hybrid seed corn to giving the guests in a huge hotel year-round comfort. Such a range of uses calls for an extensive —*a complete*—line of products. And Trane manufactures the most complete line of heating and air conditioning products in the industry.

In so doing, Trane adds the extra value of engineered products. This means that every Trane product is designed by Trane engineers to match every other Trane unit, for integrated systems that perform with the unsurpassed efficiency of balanced operation.

As a further advantage, the architect, engineer, or contractor in designing heating or air conditioning systems finds every unit he needs at *one* source with the undivided responsibility of *one* manufacturer. The facilities of 85 Trane Field Offices are at the disposal of your architect, engineer, and contractor.

* * *

The Convector-radiator—modern successor to the old-fashioned cast iron radiator—has been engineered by Trane for universal application to steam and hot water heating systems, and is being produced in quantity so you can now secure it from local distributors' stocks.

TRANE

Manufacturing Engineers of Equipment for
HEATING AND AIR CONDITIONING

THE TRANE COMPANY, LA CROSSE, WISCONSIN • *Also* TRANE COMPANY OF CANADA, LTD., TORONTO, ONTARIO

We "Custom Tailor" FINNED TUBING in COPPER or STEEL

Many a heat transference problem has been solved because Tilco Fin designing is so flexible—even in your choice of metal. Yes, in every way we "tailor" the tubes to fit your needs.

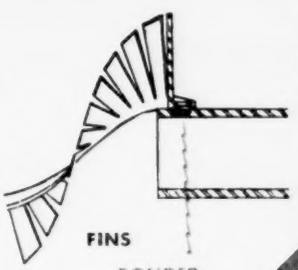
TILCO FIN *Extended Surface* TUBING

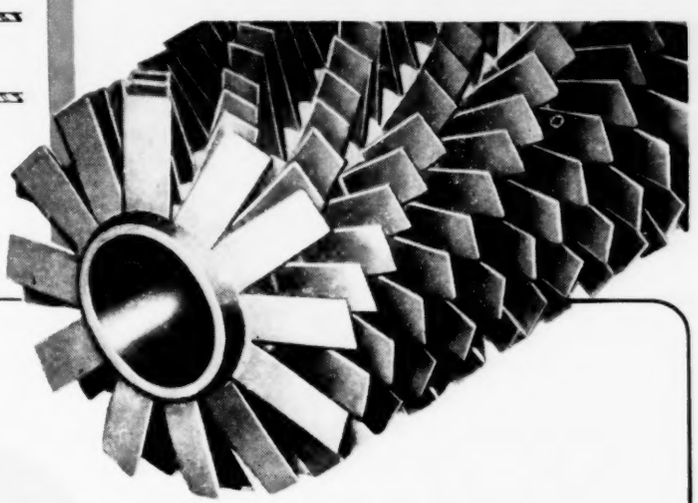
Steel fins can be welded to Steel tubes.

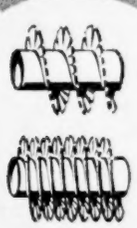
Monel fins can be welded to Steel tubes.

Steel fins can be welded to Cupro-nickel.

Copper fins can be solder bonded to Copper tubes.







Fins may be spaced as wide as three rows per inch or as close as eight rows per inch.

Fins may be any desired height starting with ¼".

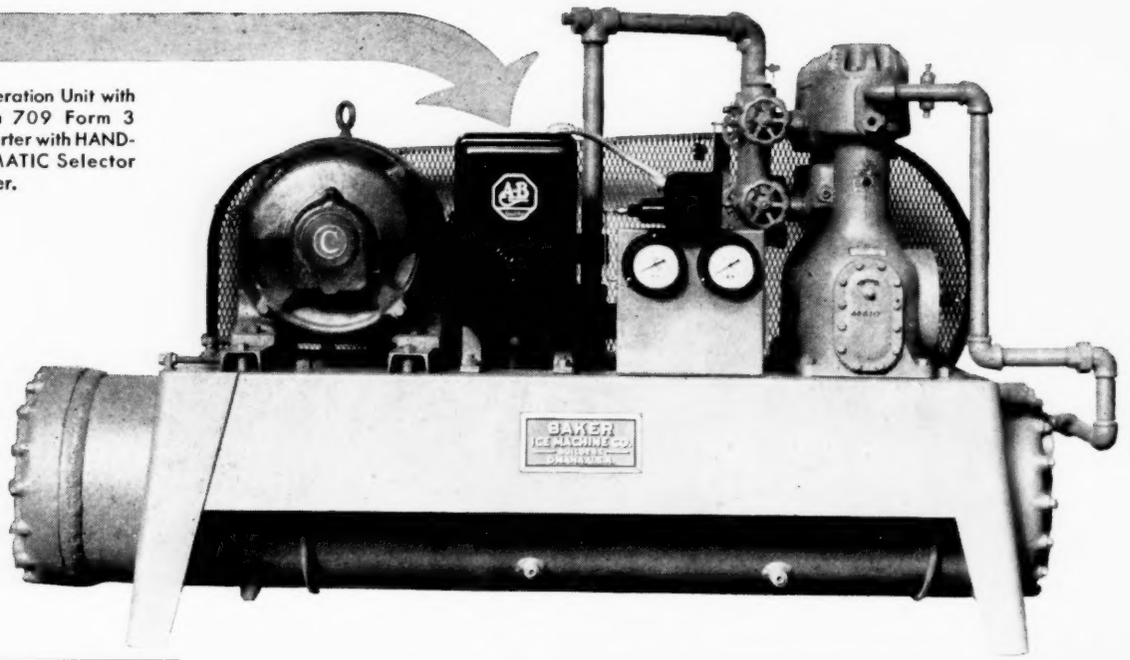
Tubes may be as small as ⅜" in diameter.
Tubes may be as large as 6" in diameter.

• Consult us about any heat transference problems. We don't promise magic or miracles. But we have done some interesting things—such as—give more efficiency with fewer tubes—or accomplish the task in less space—or deliver more effectiveness than engineers believe possible—or make installations less costly—or fit workable units into awkward areas—to mention just a few examples. And we'll be glad to submit data or submit any suggestions we can, without obligating you in any way. Call on us, it may prove worthwhile—or at least interesting.

EXTENDED SURFACE

DIVISION OF DAVID E. KENNEDY, INC.

70 Second Avenue • Brooklyn 15, N. Y.



Baker Refrigeration Unit with A-B Bulletin 709 Form 3 Automatic Starter with HAND-OFF-AUTOMATIC Selector Switch in cover.

BAKER REFRIGERATION UNITS

equipped with

Trouble-Free Motor Controls

A-B Quality

Bulletin 709 solenoid motor starter for automatic refrigeration control. White interior reflects light in dark corners. Ample wiring space.

ALLEN-BRADLEY STARTERS ARE TROUBLE FREE. Only one moving part. No pivots, pins, or bearings to corrode or stick . . . no jumpers to break. You install them . . . and forget them!

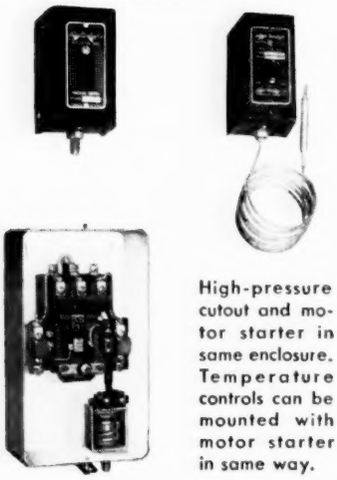
NO CONTACT MAINTENANCE. Allen-Bradley patented silver alloy contacts never need cleaning, filing, or dressing.

DEPENDABLE OVERLOAD RELAYS. Allen-Bradley thermal relays are accurate and dependable even after long service.

The A-B trademark stands for millions of trouble-free operations. Allen-Bradley Co., 1330 S. Second St., Milwaukee 4, Wisconsin.

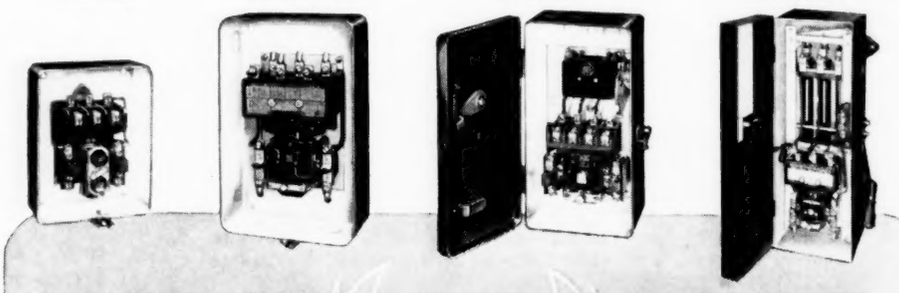
ALLEN-BRADLEY AIR-CONDITIONING AND REFRIGERATION CONTROLS

PRESSURE AND TEMPERATURE CONTROLS



High-pressure cutout and motor starter in same enclosure. Temperature controls can be mounted with motor starter in same way.

MANUAL STARTER | AUTOMATIC STARTER | COMBINATION STARTER | HEAVY COMPRESSION STARTER



ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

Architects, Mills & Petticord, Washington 2, D. C. • Contractors, James Plumbing & Heating Co., Inc., Alexandria & Richmond, Virginia • Andre Merle Associates, Registered Engineers, Washington, D. C.

1500 APARTMENTS - 100 Buildings

Belleview Apartments - Fairfax, Virginia

Why does Sarcotherm receive preference when exacting comparisons of controls for hot water or radiant heating systems are made? It always boils down to the fact that no other system can give more comfortable heat and that the simplicity, low first cost and substantial fuel savings of Sarcotherm make it an obvious choice.

The control valve is as simple as a water blender in fact, it is an adaptation of a Sarco product that has given satisfactory service for years. Water temperatures are continuously modulated as called for by changes in outside temperature, insuring utmost comfort and fuel economy.

Ask the Sarcotherm Heating Engineer nearest you for user testimonials in your vicinity. Cat No. 500 will be sent on request.

Sarcotherm
WEATHER
CONTROL

FOR HOT
WATER AND
RADIANT
HEATING

10

Sarcotherm

SARCOTHERM CONTROLS, INC. • Empire State Bldg. • NEW YORK 1, N. Y.

ROTO-CLONE

removes the double danger of fibrous, greasy dust

DUST presented a double danger in the polishing department of Mouldings, Inc., Indianapolis, Ind., producers of stainless steel moulding for the automotive field. Buffing metal moulding strip produces a fibrous, greasy dust which is both a fire and health hazard. Here, as in scores of plants, Type N Roto-Clones solve the problem by wet collection of the material.

View showing three of 14 Type N Roto-Clones collecting buffing dust in this modern plant.

The Type N Roto-Clone* Hydro-Static Precipitator combines centrifugal forces and intimate intermixing of water and dust-laden air for extremely high cleaning efficiency. It is compact in design, has no moving parts to foul, requires little maintenance and the once dangerous dust is easily removed in harmless sludge form.

The Type N Roto-Clone is available for servicing individual stands, as illustrated, or for use with central system exhausting a group of dust sources. For complete information write for copy of Bulletin No. 277 or contact your local AAF representative.

AMERICAN AIR FILTER CO., INC.
294 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

*Roto-Clone is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.

AAF®
®ROTO-CLONE
DUST CONTROL EQUIPMENT

There is no problem in sheet or strip fabrication that is completely new to

WEIRTON

Change your product design, change your dimensions, change your finish—and you have created a new problem in steel. But we have solved so many like it, there is hardly any doubt that we can solve yours.

Your problem in buying steel, when put up to Weirton, gets attention from those within our organization best qualified to give you the right answers.

Our specialists see eye-to-eye with you and look at your problem from your side of the desk. First, they serve you. Then they serve Weirton. Only in that way can you get what you hope for . . . real help on your steel problem.

WEIRTON STEEL CO.

WEIRTON, W. VA.

Sales Offices in Principal Cities

Division of NATIONAL STEEL CORPORATION

Executive Offices, Pittsburgh, Pa.

QUESTION:

How can an oil burner line support your business reputation?

ANSWER:

Your reputation as a heating contractor represents your most valuable business asset. It helps attract prospects . . . increase sales . . . boost profits.

Can an oil burner line support your reputation? You bet it can — if it's Petro! For Petro provides the basic oil burner advantages your customers want:

Fuel oil economy — assured by tubular atomization from Petro's patented oil-saving nozzle.

Heating dependability — built into every Petro by the world's largest, oldest specialized makers of oil-burning equipment.

Fine performance over many years — provided by sound Petro design, engineering and construction . . based on over 40 years' oil heat experience.

More — Petro's national advertising pre-sells millions of oil burner prospects, including those in *your* locality. Get the facts now . . . from the established heating and plumbing jobber in *your* wholesale trading area who distributes Petro oil burners, boiler-burner units, furnace-burner units, water heaters.

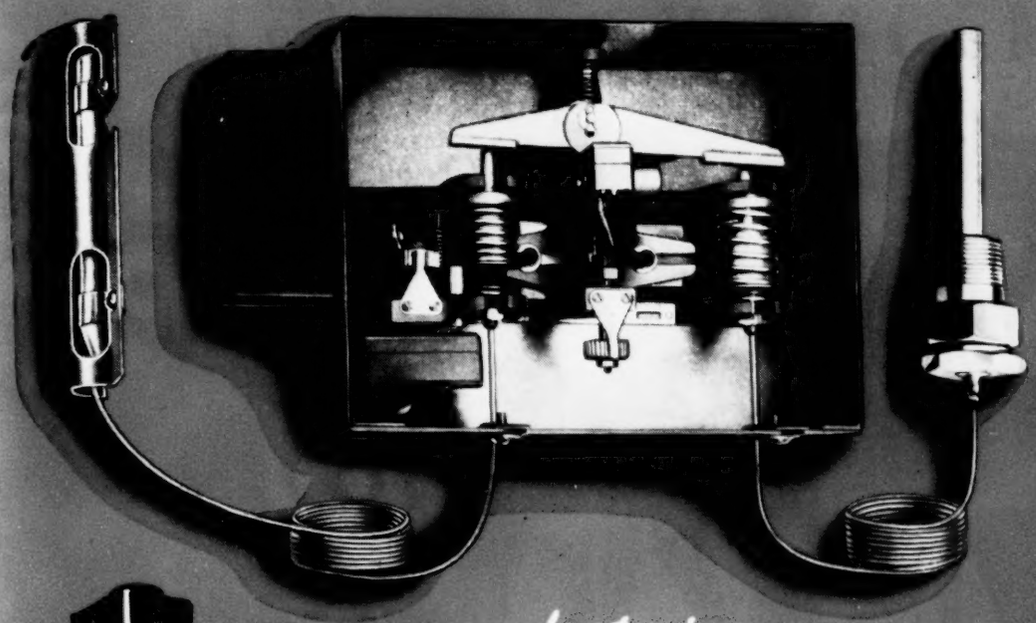
PETRO
REG. U.S. PAT. OFF.

Oil Burners • Boiler-Burner Units
Furnace-Burner Units • Water Heaters

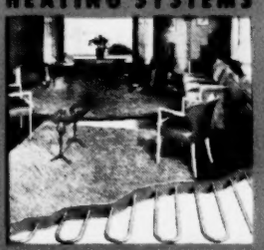
PETROLEUM HEAT AND POWER COMPANY • Stamford, Connecticut
Makers of Good Oil Burning Equipment Since 1903
REFINERIES . . FUEL OIL STORAGE AND DISTRIBUTION TERMINALS
NATIONWIDE OIL BURNER SALES AND SERVICE FACILITIES

HOFFMAN SERIES 90

Hot Water System Controls



FOR ALL TYPES OF FORCED HOT WATER HEATING SYSTEMS



PANEL HEATING

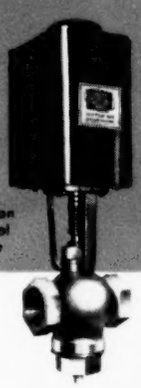
CONVECTOR HEATING

BASEBOARD HEATING

featuring

THE "COMFORT CONTROLLER"

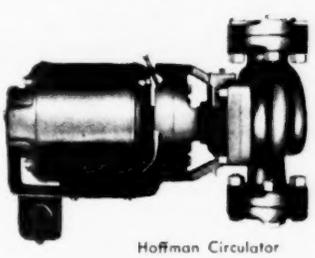
Automatically varies temperature of water in the heating system to compensate for outdoor temperature changes.



Hoffman Control Valve

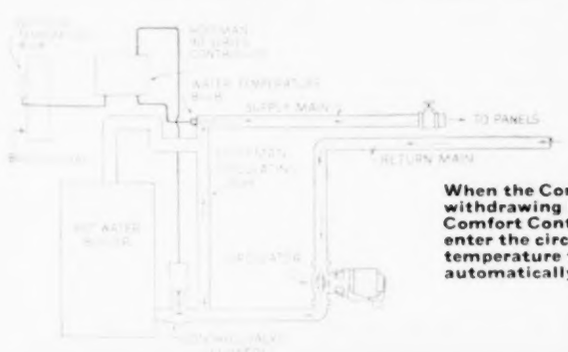
Constant comfort uniformly maintained by

CONTINUOUSLY CIRCULATED WATER



Hoffman Circulator

The Hoffman Series 90 Hot Water System with its automatic regulatory features, is the ultimate in precise control for *any* application of hot water heating —whether panels, radiators, convectors or radiant baseboards are employed. The Comfort Controller, or *brain* of the system, is activated by Outdoor and Water Temperature Bulbs which transmit temperature changes to its accurate balancing mechanism—automatically opening or closing the Hoffman Control Valve to maintain the desired temperature of *continuously circulating* water to meet the need for heat. *Zoning* of apartments or sections of large residences to suit personal preference or functional activities of the building may be obtained with Series 90 Systems. The diagram below shows the basic operating principle of this system. Thousands of installations now in operation acclaim its merits.



HOW THE HOFFMAN SERIES 90 CONTROLLER OPERATES

When the Control Valve is closed, continuously circulating water by-passes the boiler without withdrawing heat. When water has lost heat, as noted by the Water Temperature Bulb, the Comfort Controller slowly opens the Control Valve, permitting hot water from the boiler to enter the circulating stream. When sufficient hot water has been admitted to restore the proper temperature to the circulating water, the Valve is closed by the Controller. This cycle repeats automatically in anticipation of weather changes.

HOFFMAN SPECIALTY COMPANY

Dept. HV-2, 1001 York St., Indianapolis 7, Ind.

FAMOUS FOR HOFFMAN VALVES, TRAPS, VACUUM AND CONDENSATION PUMPS, FORCED HOT WATER HEATING SYSTEMS

The JOY "SERIES 1000" AXIVANE FAN

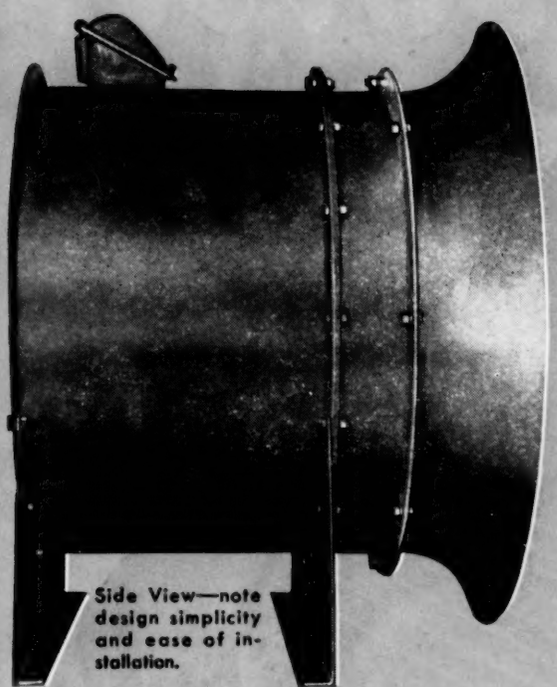
Engineered to do its job better — and at lower cost!

On-the-job Adjustable Blades—
an exclusive Joy feature

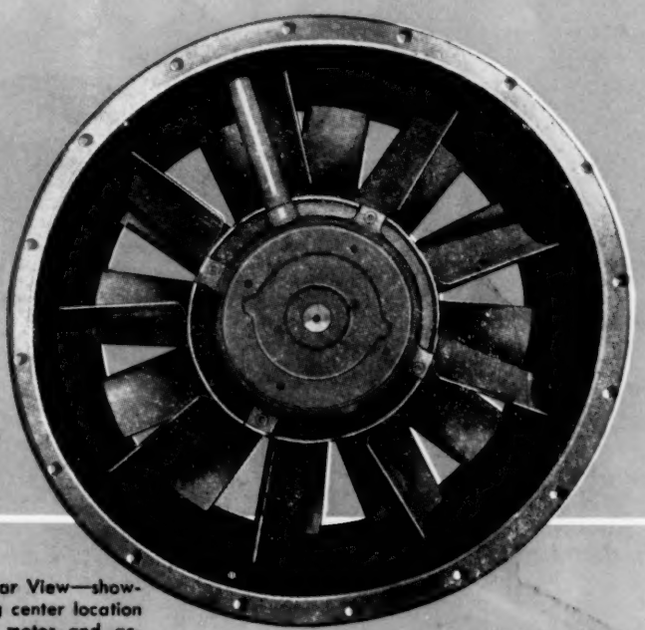
Call for a Joy Engineer

The JOY "SERIES 1000"

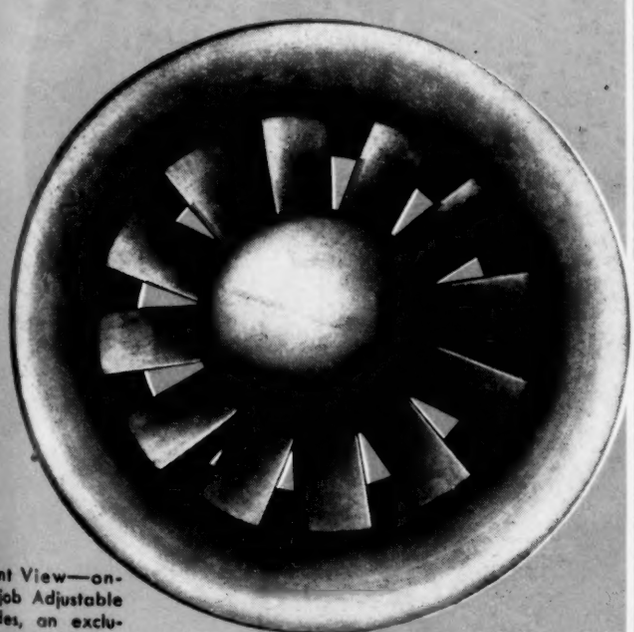
is a complete integrated line of stock vaneaxial fans for industrial use with a range of volumes up to 100,000 C.F.M.



Side View—note design simplicity and ease of installation.



Rear View—showing center location of motor and accessibility of parts.



Front View—on-the-job Adjustable Blades, an exclusive Joy feature.

JOY AXIVANE FAN APPLICATIONS

Apartment Houses
Aircraft
Air Conditioning Systems
Auditorium Ventilation
Automotive

Boiler Draft

Caves
Chemical Plants
Cleaners
Cooling Towers

Dehumidifiers
Diesel Engine Cooling
Dryers
Dust Collectors

Evaporative Condensers

Fan Heating Systems
Filtering Systems

Generator Cooling
Grain Drying

Hay Driers
Hair Dryers
Hospitals
Hotels
Humidifiers

Kitchens

Laundries

Mines

Oil Burners

Pharmaceutical Mfg.
Pneumatic Conveyors

Railroad Cars
Refineries
Residence Heating

Schools
Ships
Stokers

Textile Mfg.
Tunnels

Unit Coolers
Unit Heaters

Vacuum Cleaners

Wind Tunnels

Write for complete illustrated bulletin showing applications, charts and detailed information.

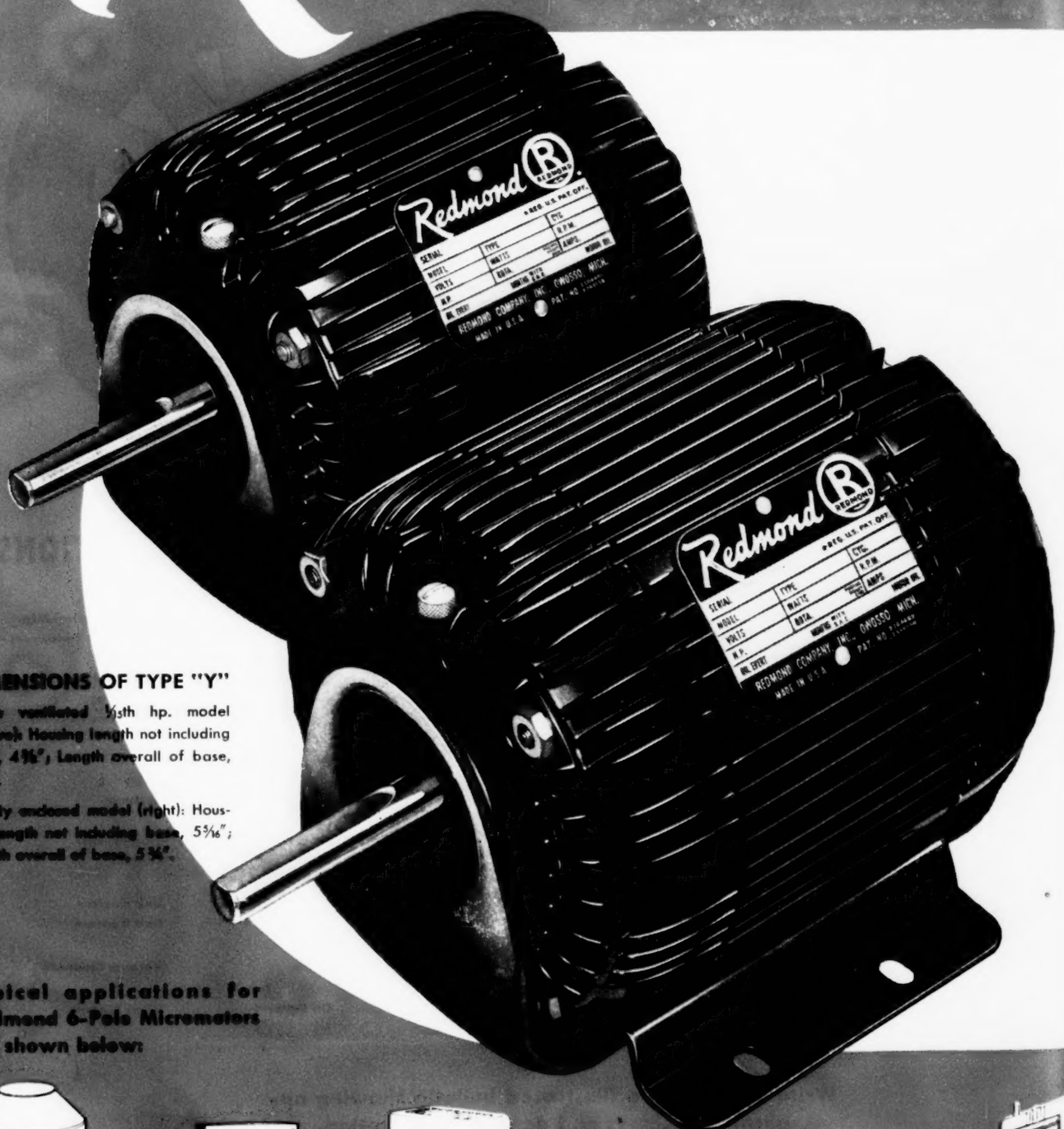
W&D 11524

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

NOW...OUTSTANDING

Redmond



DIMENSIONS OF TYPE "Y"

Open ventilated 1/15th hp. model (above): Housing length not including base, 4⅛"; Length overall of base, 5⅛".

Totally enclosed model (right): Housing length not including base, 5 5/16"; Length overall of base, 5¾".

Typical applications for Redmond 6-Pole Micromotors are shown below:

Hot Air Furnaces

Exhaust Fans

Floor Heaters

Unit Coolers

Floor Air Circulators

Unit Heaters

NEW SIX POLE A.C.

MICROMOTORS

UP TO 1/15th HORSEPOWER AT 1000 R. P. M.

NOW the Redmond 6-poles are ready. And you'll find them outstanding.

We've given these Micromotors many extra months of engineering, crowded them with refinements and put them through tough tests. The important details of perfection are thoroughly implanted.

These 6-pole shaded pole designs answer the needs for applications where slower speed with full rated loads are desired. They bring you up to 1/15th horsepower, ventilated, at 1000 r.p.m., to handle deep pitch fans with a minimum of air sound. They are also available in totally enclosed models at slightly lower horsepower ratings.

Here's construction you'll marvel at. First take a glance at the Fin-Line functional styling. Maximum die cast surfaces for cooling are formed to compliment the modern appearance of your products.

Then consider the patented, precision skewed Flush-Weld rotors with completely filled slots . . . no open areas to collect chips, dust and dirt. They're rust inhibited, accurately balanced, and made of fine electrical grade steel.

The field "lams" and coils are pneumatically stacked, machine wound, varnish baked jobs. Perfection is on a production schedule that's hard to believe.

Bearings and lubrication are the magic key to long life. Redmond 6-pole Micromotors have extra large porous bearings individually fitted to within .0001″ tolerance. Besides filtering the lubricant, their special Redmond design induces constant recirculation. 6 cubic inches in oil reservoirs is comparable to motors of much larger size.

They're adaptable Micromotors too. Heavy studs can be had for flange mountings. Or you can have the smoothly styled compact bases, insulated from the Micromotors by generous live rubber cushions.

Get the complete story and prices. Ask about the Type "Y", newest of the dependable Redmond Micromotors. *Phone or write today.*

BUILT BY SPECIALISTS

You can expect and will receive complete cooperation on your motor problems at Redmond Company, Inc. Here is an organization of specialists, who manufacture Micromotors, speed controllers and small blower units, exclusively—*no complete consumer products to compete with products of customers.*

☆ *Expanded facilities. Prompt deliveries. Service before and after the sale.*

Redmond COMPANY, Inc.

MAIN OFFICES: Owosso, Michigan

EASTERN AREA SALES: 420 Lexington Ave., New York 17, N. Y.

PACIFIC COAST SALES: Redmond Company of Calif., Inc., 222 W. 9th St., Los Angeles 15, Calif.

Redmond facilities include 2000 employees and over 5 acres floor area.

REDMOND

PAT. OFF.

NO "STARVING" HERE

G-E Direct Expansion Coils are designed for even refrigerant distribution

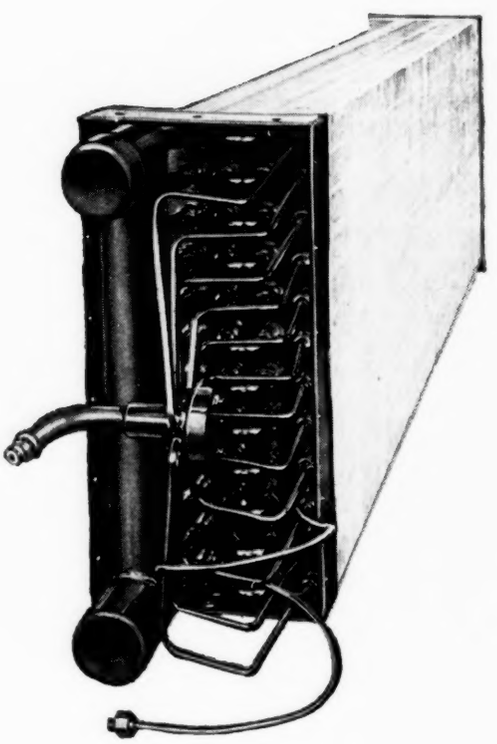
Every General Electric direct expansion heat transfer surface is designed to produce proper refrigerant control and distribution without flooding or starving of the coils.

These G-E Coils include the proper "Freon" distributor to give balanced refrigerant circuits. It's easy to clean this distributor, too, without disconnecting refrigerant piping.

Other features which make G-E direct expansion coils so reliable are the continuous formed fins for extra stiffness, air turbulence, and the electro-thermally bonded collars for high heat transfer efficiency.

There's a full line of General Electric Coil assemblies... including direct expansion, water, and steam coils. Your General Electric representative is an expert on heat transfer problems. Ask him for his suggestions.

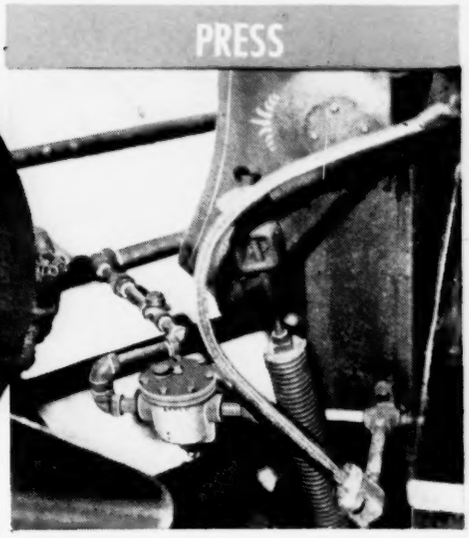
General Electric Company, Air Conditioning Department, Section A8912, Bloomfield, New Jersey.



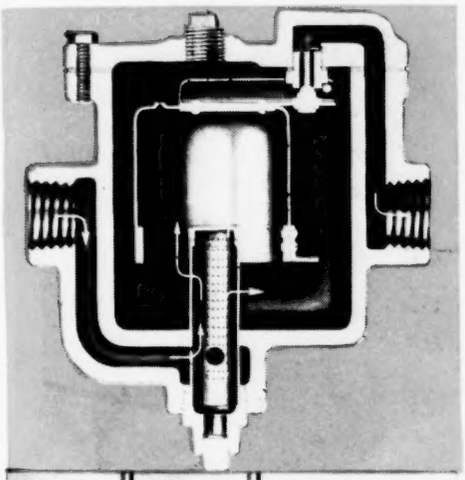
Leader of G-E's line of finned heat transfer surface is the easy-to-maintain, simple to install, Direct Expansion Coil Assembly . . . for Air Conditioning, Commercial Refrigeration, Low Temperature Refrigeration.

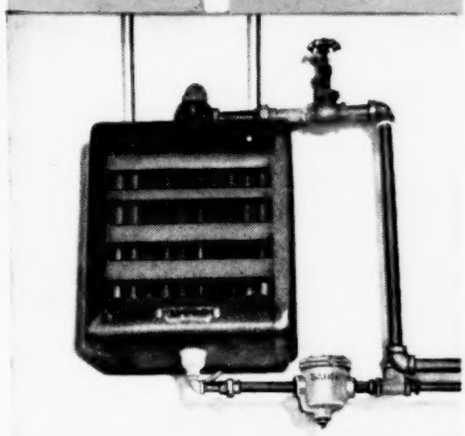
GENERAL ELECTRIC

Refrigeration and Air Conditioning



How Sarco Keeps Big Laundry





UNIT HEATER

out of the red and on its toes!

Laundry profits are rated in fractions of a cent per piece. Competition is keen and the savings in fuel and working time that can be made by installing the right steam trap at every point are often the difference between profit and loss.

In this Atlanta plant Sarco Steam Traps speed and save at every step. The hot water service became thoroughly dependable, at a lower fuel cost when the Sarco Bucket Trap shown above, was installed.

Girls working at presses, pants stretchers and other heavy steam using equipment can go as fast as they like because Sarco Bucket Traps are on each machine and on the steam headers.

Heat for the help is no longer a problem because the Sarco Bucket Trap removes condensate from the unit heaters as fast as it collects.

If your plant uses a lot of heat intermittently, it would be well to look into the advantages of the Sarco Bucket Trap. Three other types and a complete line of temperature controls are at your service through the Sarco Representative near you.

172

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SARCO COMPANY, INC.

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SARCO CANADA, LTD., TORONTO 5, ONTARIO

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SELL THEM CLEAN, RELIABLE OIL HEATERS EQUIPPED WITH "DETROIT" FLOAT VALVES

People old enough to have cleaned up after a smoky, sooty, dusty "base burner" particularly appreciate the comfort of clean, reliable oil heat. Grandma, as well as her children and grandchildren, want the home clean, warm and comfortable.

Sell them the maximum comfort of clean, reliable oil heating devices—"Detroit" Float Valve controlled. The comfort market is profitable.

"Detroit" Float Valves are durable, dependable—provide sure regulation of oil fired space heaters, water heaters, furnaces, and ranges. Temperature compensated, flow is not affected by cold or warm oil.

"DETROIT" CRC-239 FLOAT VALVE

Made in several types for various services. Manual regulation for space heaters, ranges and floor furnaces—tank temperature regulation for water heating—thermostat control for furnaces, space heaters or floor furnaces. Furnace type valves may be had with automatic fan switch

"DETROIT" Float Valves—GUARDIANS OF THE HOME FIRES

2903

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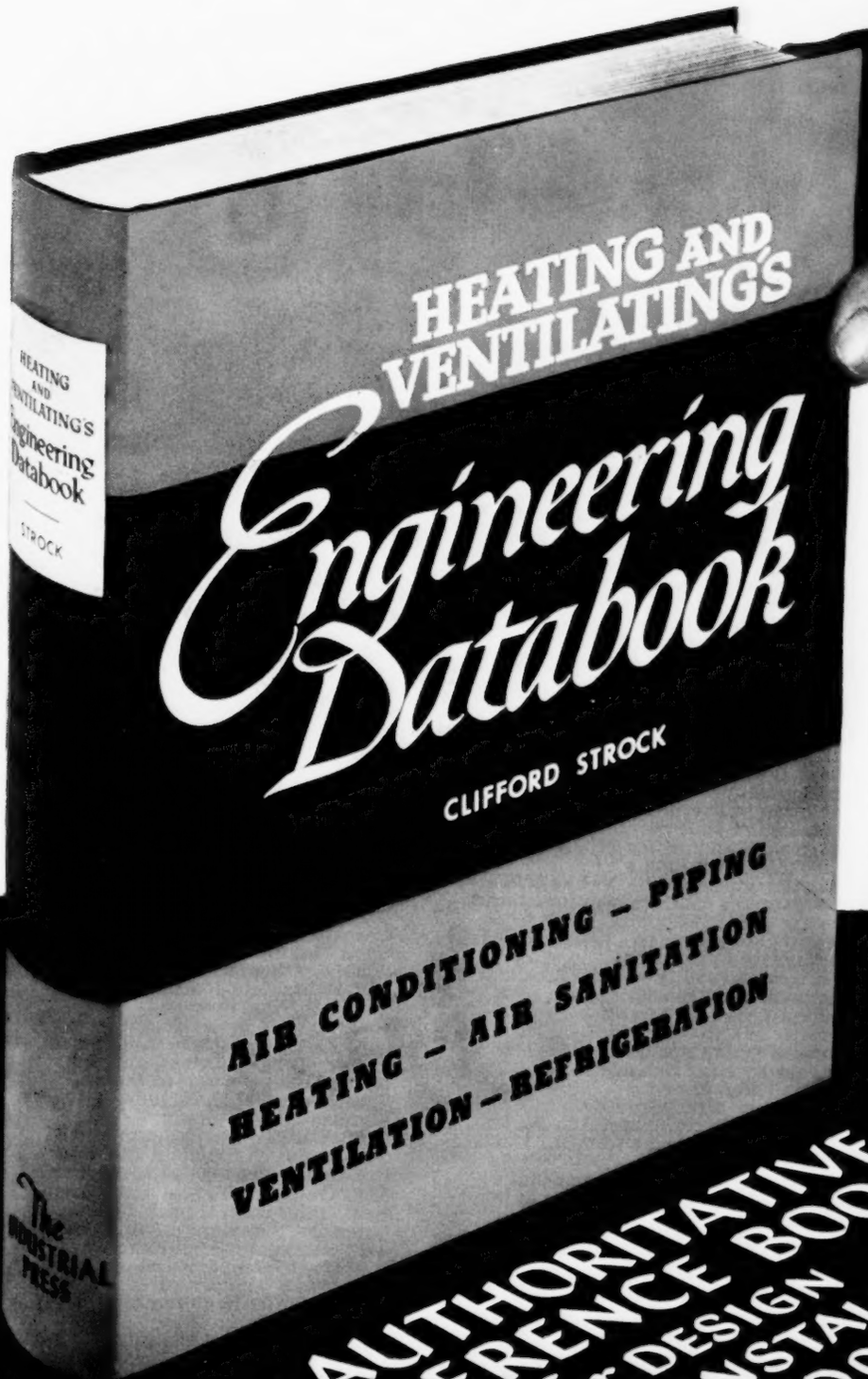
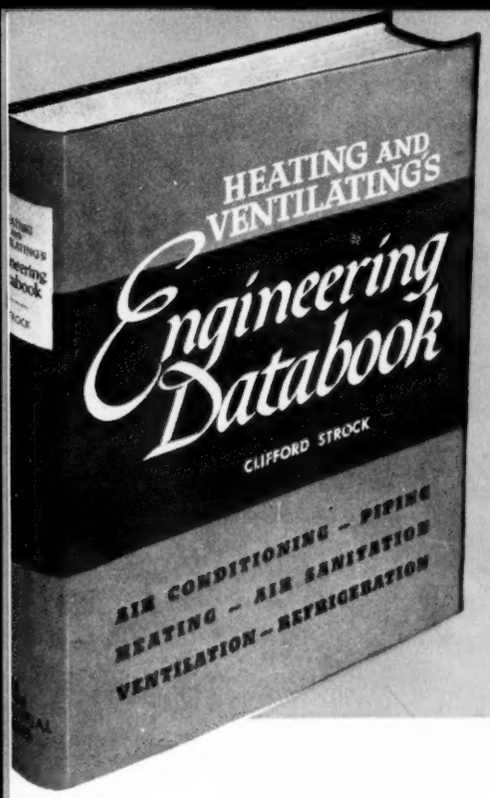


NEW!

PUBLISHED
FEBRUARY 1948

AN AUTHORITATIVE REFERENCE BOOK for DESIGN INSTALLATION AND OPERATING Engineers

FOR DETAILS SEE NEXT THREE PAGES



HEATING AND VENTILATING'S Engineering Databook

This list of 175 subjects indicates the great scope of the Engineering Databook. These general subjects include hundreds of useful items which may be readily located by means of the very complete index.

A Complete Picture of the Contents

Principles of Psychrometry
Properties of Dry Air
Miscellaneous Properties of Water
Thermal Properties of Water
Psychrometric Tables and their Use
Relative Humidity Tables
Dewpoint Tables
Vapor Pressure Tables
Effective Temperature Tables
Absolute Humidity Tables
Psychrometric Charts and their Use
Comfort Air Conditioning Charts
Dewpoint Temperature Chart
Humidity Chart
Altitude Density Chart for Air
Theory of Combustion
Combustion Temperatures; Efficiency of
Air Required for Perfect Combustion
Flue Gas with Perfect Combustion
Heat Lost in Flue Gas
How to Analyze Flue Gases
Dew Point of Flue Gases
Combustion Data for Typical Fuels
What the Flue Gas Analysis Means
Classification and Properties of Coals
Ultimate and Proximate Analysis of Coal
Heating Value of Coals
Sizes of Coal and Coke
Storage Space for Solid Fuels
Combustion Efficiency — Bituminous Coal
Combustion Efficiency — Anthracite
Overfire Jets for Smoke Reduction
Liquid Fuels Class. and Properties
Fuel Oil Weight and Volume Equivalents
Storage Space for Liquid Fuels
Contents of Cylindrical Tanks
Contents of Partially Filled Tanks
Combustion Efficiency — Oil
Gas Fuels, Class. and Properties
Combustion Efficiency — Gas
Determining Equivalents of Fuels
Comparison of Fuel Costs
Chimney Sizing
Chimney Construction
Fundamentals of Fluid Flow
Viscosity of Liquids
Definition of Pipe Fittings
Pipe Threading
American Standard Taper Pipe Threads
Data on Iron and Steel Pipe
Data on Copper Tubing
Carrying Capacity of Pipe and Tubing
Estimating Friction in Cold Water Piping
Cold Water Friction Charts
Estimating Friction in Hot Water Piping
Hot Water Friction Charts
Sizing Steam Piping
Pressure Drop in Steam Pipe Lines
Velocity of Steam in Pipes
Sizing Pipe for Steam, Gases, Vapors
Steam Losses from Piping
Pipe Insulation
Insulation to Prevent Sweating on Pipes
Expansion of Pipe
American Standard for Pipe Fittings
Identification of Piping
Water Hardness and pH Values of Water
Pipe Materials for Corrosion Resistance
Spacing of Pipe Supports
Centrifugal Pumps
Air Velocity Conversion
Velocity Equivalents of Gage Readings
Charts for Duct Sizing
Friction Losses in Elbows
Capacity of Circular and Rect. Ducts
Tables of Duct Capacities
Air Velocity Near Exhaust Hoods
Steel and Iron Sheets
Non-Ferrous Metal Sheets
Estimating Weight of Metal in Ducts
Heat Gains and Losses from Air Ducts
Fans and Blowers
Standard Fan Drive Arrangement
Max. Concentration of Air Contaminants
Potential Industrial Health Hazards
Code for Attic Ventilation
Characteristics of Air Cleaning Methods
Compressed Air Flow Charts
Weight of Air — Press. and Temp. Variants
Compression of Air
Power to Compress Air
Thermometric Scales and Conversion
Specific Heats
Heat Transfer by Convection
Heat Transfer by Radiation
Conductivity of Building Materials
Heat Transmission Coefficients
Inside Wall Surface Temperatures
Heat Loss Through Basementless Floors
Window Condensation
Estimating Amount of Ventilation Air
Ventilation Volume for Buildings
Heat Loss by Air Infiltration
Heat Loss by Humidification
Infiltration Loss for Doors, Windows
Short Cut Heat Loss Estimating
Heat Emission of Cast Iron Radiators
Variation in Air Temperature in Room
Operative Temperatures
Lowest Temperatures Recorded in U. S.
Frequency of Low Temperatures
Design Temperatures for Heating
Date Heating Season Begins and Ends
Average Temperature in Heating Season
Winter Ground Temperatures
No. of Hours Auto. Heating Plant Operates
Estimating Fuel Consumption
Degree-Day Tables
Rating of Heating Boilers
Radiant Heating
Greenhouse Heating
Determining Amount of Steam Flash
Mixing of Hot and Cold Water
Cold and Hot Water Requirements
Sizing Hot Water Heaters and Tanks
Steam Used by Restaurant Appliances
Heat Wasted by High Inside Temperatures
Checklist for Heating System Servicing
Checklist for Fuel Conservation
Snow Melting
Solar Heating
Electric Radiant Heating
Electrothermal Storage
Heating with Diesel Engines
Outside Temperatures in Summer
Highest Temperatures Occurring Annually
Design Temperatures in Summer
Frequency of High Summer Temperatures
Summer Degree-Hours
Infiltration Losses in Summer
Sun Angles Throughout the Year
Estimating Heat Gains from the Sun
Heat Gains from Pipes and Ducts
Heat Gains from Human Beings
Short Cut Summer Cooling Estimates
Air Conditioning Unit Estimating
City Water Temperatures
Well Water Temperatures
Cooling Water Requirements
Cooling Towers
Refrigeration Heat Quantities
Rate of Circulation of Freon-12
Refrigeration Compressor Capacity
Heat Added by Refrigeration Compressors
Properties of Refrigerants
Sizing Refrigerant Piping for Air Cond.
Air Conditioning Maintenance Schedule
The Heat Pump
Motor Selection
Motor Terms
Motor Standards
Standard Motor Dimensions
Checklist for Motor Troubles
Selection of V-Belts
Law of Contracts — Essential Facts
Logarithms — Application and Tables
Circumferences and Areas of Circles
Standard Drafting Room Practice
Standard Abbreviations
Mathematical Signs and Symbols
Commonly Used Constants
Drafting Room Symbols
Checklist for Air Conditioning Drawings
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Terminology

A NEW Reference Book

for: Heating Engineers · Estimators · Air Conditioning Engineers · Ventilating Engineers Architects · Piping Engineers · Contractors Plant Engineers · Operating and Maintenance Engineers · Engineering Students.

576 Pages — 317 Essential

Tables, 193 Charts and Illustrations. The 8½" x 11" page size provides space for large-scale, easy-to-read charts, which eliminate or greatly simplify your calculations.

The Scope of the Engineering Databook

Heating and Ventilating's New Engineering Databook is an authoritative reference book providing working data on heating, ventilating and air conditioning for design, installation and operating engineers. Its time-saving tables and large-scale charts greatly simplify everyday estimating and design problems. The table of 175 subjects shown on the opposite page indicates the great variety of practical information you will find in the Engineering Databook. These subjects are grouped under the following eleven main divisions, which briefly illustrate the range covered by this valuable reference work.

1. Heat and Moisture in Air
2. Fuels and Combustion
3. Piping — Sizing, Standards, etc.
4. Air Handling and Ventilation
5. Heating and Heat Transmission
6. Cooling and Air Conditioning
7. Motors — V-Belt Drives
8. What the Contractor Should Know About Contracts
9. Mathematical Tables
10. Drafting Room Standards
11. Terminology of the Industry

Important Data on Recent Developments

The Engineering Databook is filled with fundamental information, but its overall scope is considerably more than the covering of commonly used data. In addition, the latest information is presented on the important subjects shown in the following list:

The Heat Pump — Use of a refrigerating machine for both heating and cooling a building.

Electrothermal Storage — Drawing the electric energy from the lines during the night and other off-peak hours, and storing the energy as heat in water tanks, to be drawn on as needed.

Snow Melting — Circulation of hot water containing antifreeze through coils embedded under sidewalks, steps, porches, driveways, etc., for automatic snow removal.

Heating with Diesel Engines — Heating buildings by the use of heat otherwise wasted in the jacket cooling water and the exhaust of diesel engines.

Attic Ventilation—Pointers on proper design and installation of attic fans for cooling residences.

Heating Water by the Sun — Data and drawings showing how use can be made of solar heat for heating domestic hot water.

Radiant (Panel) Heating — Data on radiant heating by use of buried electric cables, or buried coils containing hot water, making the heating equipment in the room invisible.

Basementless Buildings—Authentic data on the calculation of heat losses through concrete slabs on the ground and through floors over a crawl space.

Axial Flow Fans — A thoroughgoing discussion on the advantages and disadvantages of axial flow fans as compared with centrifugal fans.

Estimating for Air Conditioning Units — Latest short-cut methods for determining the size of unit air conditioners for cooling offices, stores and residences.

Toxicity — Latest complete and official data on M.A.C. (maximum allowable concentration) of fumes, gases and dust, for determining ventilation quantities.

What You Should Know About The Law of Contracts

A most useful and unusual feature of the Engineering Databook is the 18-page section devoted to the law of contracts. This section is based on actual high court decisions which apply specifically to heating, ventilating and air conditioning cases. In this section are discussed: the validity of contracts, implied warranty, technical competence, alteration of plans, extras, subcontracting, substitutions, inconspicuous clauses, guarantees, distinction between employee and contractor, and many other points covered in the law of contracts. Each case used as an example is one in which a heating, ventilating or air conditioning contractor or engineer was involved. In addition, other legal subjects which concern heating men are discussed, such as: patent infringement, real estate law, relations with municipalities, mechanic's liens, withdrawals of bids, and "cost plus" contracts.

Postpaid in U. S. **$7.00** **Order Form on Next Page**

For Canadian or Foreign orders, please add 80c postage.

How Many of the Questions on the Next Page Can You Answer?

Do You Know the Answers?

The sample questions below indicate the comprehensive down to earth character of HEATING AND VENTILATING'S ENGINEERING DATABOOK. You will find the answers to hundreds of questions like these in the DATABOOK.

Is a "splitter" in a duct elbow of greater advantage with large curve ratios or small curve ratios?

What is the difference between total heat, enthalpy and sigma function of air?

What trouble would you look for with an a.c. motor which runs and then dies down?

The speed of a pump is increased 25% to increase its capacity 25%. Would the increase in horsepower required be of the order of 25%, 50%, 100% or 200%?

Is there a worthwhile saving in insulating the edge of a concrete floor slab in a basementless home?

What air velocities are recommended through the ceiling grille in an attic fan installation?

An exhaust hood is to carry a dangerous fume from a machine operated by a worker 36 inches away. If the air velocity is too low, the fumes will be breathed by the workman, if too high, power costs will be excessive. Can the air velocity 36 inches from the hood be simply calculated?

In general, which has the better adaptability to an installation with a fluctuating system characteristic — an axial flow fan or a centrifugal fan?

If the owner modifies your plans and specifications for a heating system, are you liable for errors?

What is the difference between motors of the following types — varying speed motor, adjustable speed motor, adjustable varying speed motor?

In an Orsat analysis, what would the presence of carbon monoxide with free oxygen indicate?

When would you locate a relief valve on a hot water supply system if it is (a) of the pressure type, (b) of the pressure-temperature type?

Which roof covering would result in the larger load on the air conditioning system from solar heat — one of red asphalt shingles or a red clay tile roof?

How would chemical drying of air be plotted on a psychrometric chart?

What is the objection to a spray pond for cooling water for a refrigeration system?

In a cost-plus contract can the contractor charge for depreciation of equipment?

The dew point of a flue gas is not the temperature at which the water vapor condenses out. What is it?

What range of air velocity should be used in an exhaust system for foundry dust?

What is the purpose of the capacitor in a capacitor motor?

If a contractor manufactures a patented device for his own use is he liable for infringement?

What is the difference between perfect combustion and complete combustion?

Three radiators in the same system are identical except that one is painted with gold bronze, one with white paint, one with brown paint. Which will have the highest heat emission?

What is a simple formula for determining the seasonal fuel oil requirements for a heating plant?

Which pipe most needs insulating because of heat loss — a 3 inch pipe carrying steam at 300 lb. pressure or a $1\frac{1}{4}$ inch pipe with 150 deg. superheated steam at 200 lb. pressure?

How would you determine the number of hours an oil burner would operate in an average heating season in your city?

In combustion, how is the per-cent of excess air determined?

Place your order now for this authoritative reference book. Use the coupon below with Refund Offer.

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I enclose check, postal note or money order for $____, including 80c Canadian or foreign postage if necessary. Please send me a copy of HEATING AND VENTILATING'S New ENGINEERING DATABOOK. I have the right to return the book within 5 days and money will be refunded.

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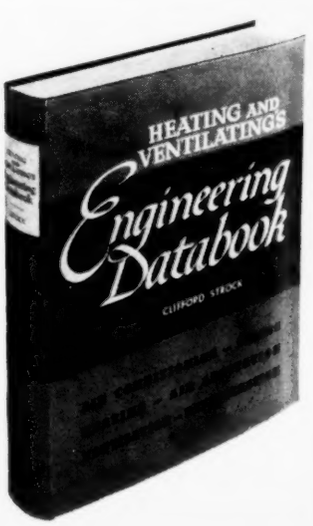
Home Address_____

City_____ Postal Zone_____ State_____

Firm*_____ Position*_____

*This information would be appreciated for our private records.

2/48



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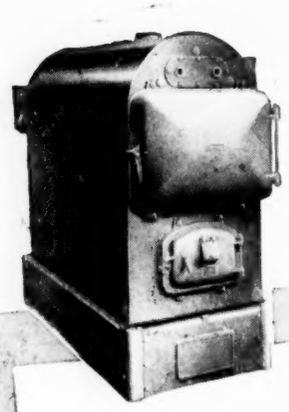

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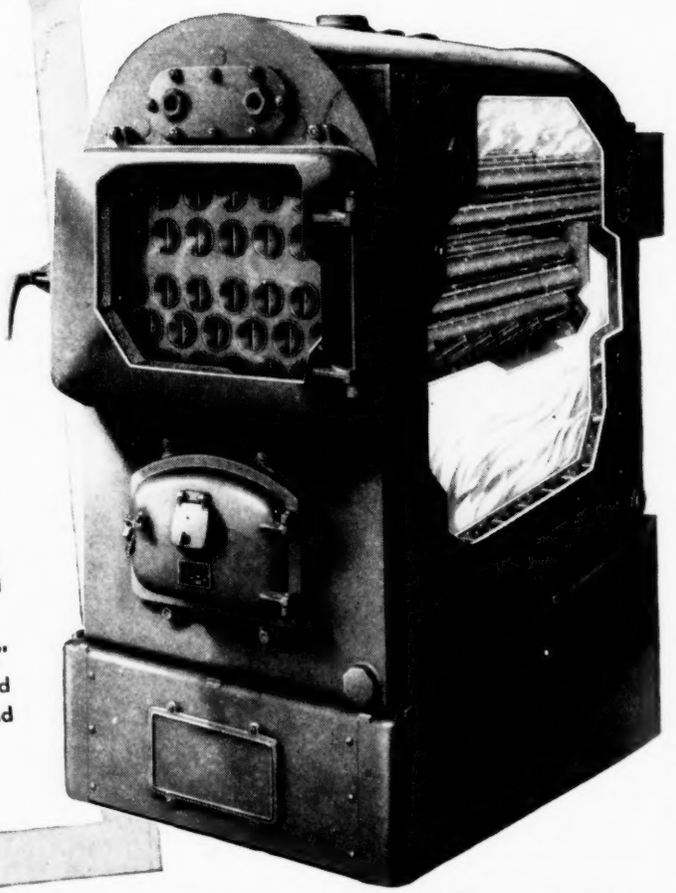

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This walk at West Newton, Mass., is kept free from ice and snow by circulating warm water through Rayduct steel pipe embedded in the concrete. Heating Contractor: New England Radiant Heating Co., Boston.

BELOW: In this novel installation, Rayduct, fastened under heads of rails and covered with metal plate, and carrying steam, keeps tracks clear of snow at Olyphant, Pa., Colliery of Hudson Coal Co.

There's no need today to put up with the annoyance and inconvenience of snow shoveling during winter months. For thanks to coils or grids of Rayduct steel pipe, carrying warm water under concrete or other surfacing material, snow can be removed quickly and easily.

Rayduct is the ideal pipe for snow-removal and radiant-heating systems because it's so easy to bend and weld. It's also easy to cut and thread, and it has practically the same coefficient of expansion as concrete and plaster. Moreover, it's pipe you can count on for trouble-free service in any properly designed and operated closed hot water system.

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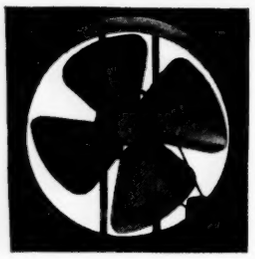

1

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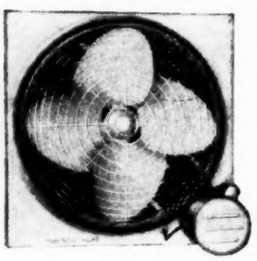
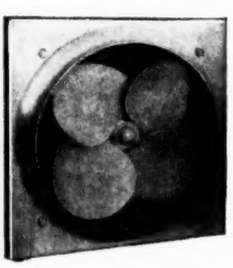


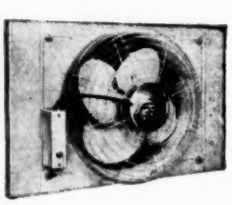
2

❶ ATTIC VENTILATORS
❷ WINDOW FANS
❸ EXHAUST FANS
❹ ADJUSTABLE WINDOW FANS
❺ PORTABLE CIRCULATING FANS
❻ DOUBLE INLET BLOWERS



3

With our enlarged facilities we can now give good service to more dealers and distributors and have some prime territory open. We would like to present a portfolio of new literature descriptive of some very unique and interesting developments for this year's ventilating business. It is yours for the asking.



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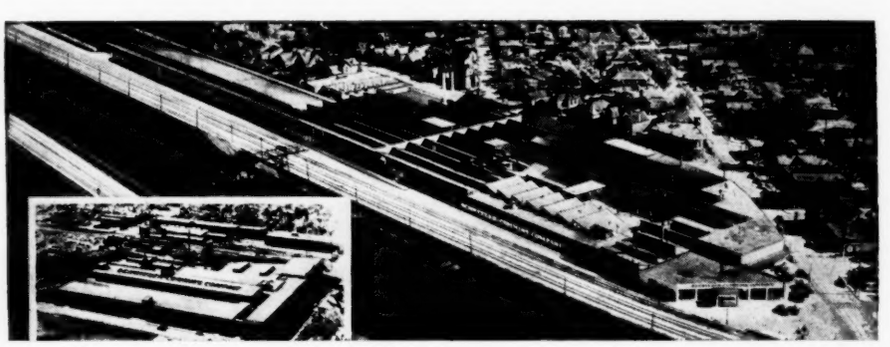

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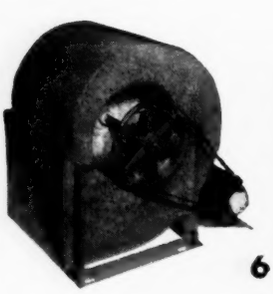

6

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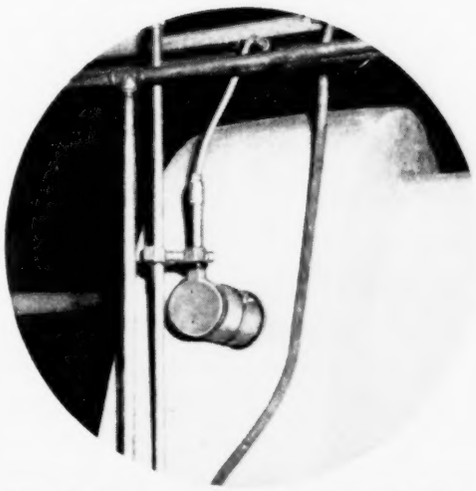

This electronic eye continuously observes density of flue gases in flue and, when necessary, adjusts motor operated air door.

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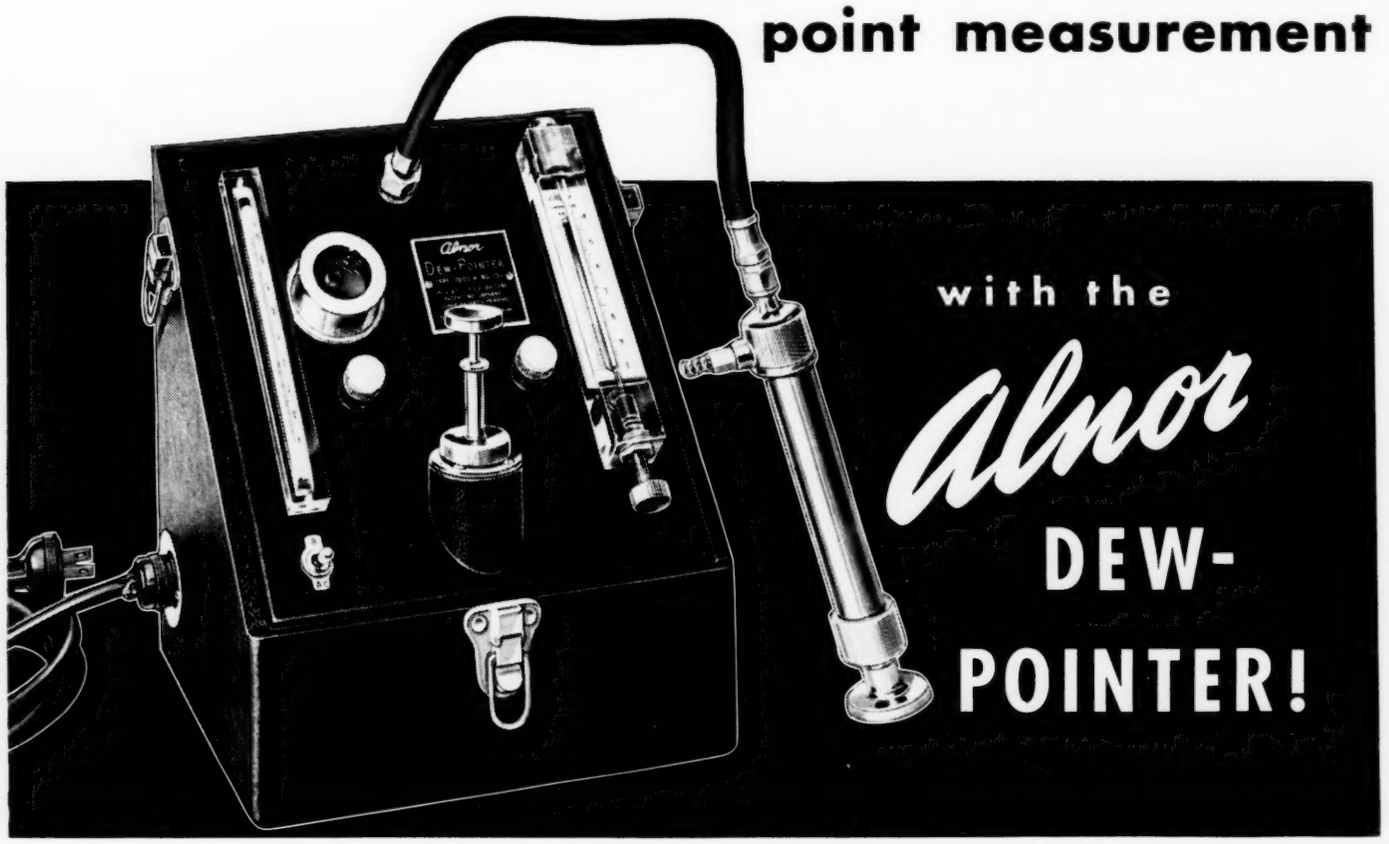

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- ★ **Greater speed in measurement!**
- ★ **Greater accuracy at all times!**

Use Coupon for Details and Prices! Now, while you're thinking about it, fill in and send this handy coupon to get the whole story on the new Alnor Dewpointer.

Illinois Testing Laboratories
RM. 514, 420 N. La Salle St., Chicago 10, Ill.

( ) Send me complete details and prices on the Alnor Dewpointer.

Name.....

Company Name.....

Address.....*City*.....*State*.....

Here's an entirely new way to measure dew point! It's the Alnor Dewpointer—precision-built unit with all the speed and accuracy you'd expect of a *true* instrument! Operating on a unique principle, the Dewpointer eliminates disadvantages inherent in other less precise methods—including inconsistent readings between two or more observers, the need for external coolants, inability to be used away from the source of the gas to be tested, etc. Simple, compact, sturdy, the Dewpointer is available in two ranges—for dew points between minus 20 F. and room temperature and from minus 100 F. to 0 F.

Alnor **PRECISION INSTRUMENTS FOR EVERY INDUSTRY**

ILLINOIS TESTING LABORATORIES, INC.
Chicago 10, Illinois

"Like Going to Florida"

says this owner of a B & G *Hydro-Flo* Panel Heating System

Here's a report on B & G *Hydro-Flo* Heating that requires no further comment: "In 1945 your company made a layout for a radiant heating job which was to be installed in a new home which we were to build and occupy. To my knowledge, this was the first job of this kind in this immediate neighborhood.

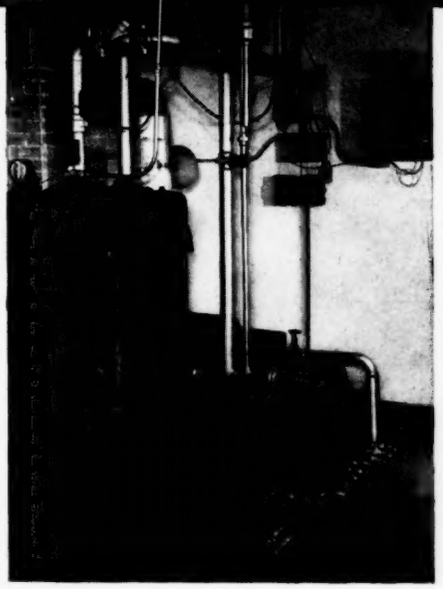
"The house was completed and occupied in the Spring of 1946. We have now completed one full heating season and want to tell you how very much we enjoy this luxurious heating.

"To go home is like working in the cold all day and then going to Florida for the night. It is hard to describe the comfort that this type of heating provides.

"We have used much less fuel than we anticipated—at least a third less. The house has been comfortable, no drafts, less dirt, and warm floors all of the time. The room temperature is carried at 68° to 70° and we were actually very comfortable.

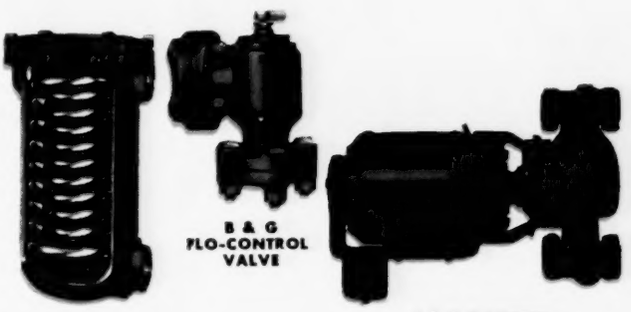
"Our boiler has been fired with a Winkler self-feed stoker, the coal bin being between the utility room and the garage which are connected together as one unit. We have a one-story house with no basement. We used wrought iron pipe with concrete floors throughout. The garage is heated also, although at a lower temperature than the house. The pipes in the bathroom are four inches apart and the balance of the house, twelve inches apart. They are eighteen inches apart in the garage.

"I appreciate the engineering information furnished by your company and want you to know all of the B & G equipment is performing 100%."



Boiler room photo shows the returns from the panels carried to a pit for draining the system if ever necessary. Square head cocks permit adjustment of water flow.

The Basic Units of a B & G *Hydro-Flo* System

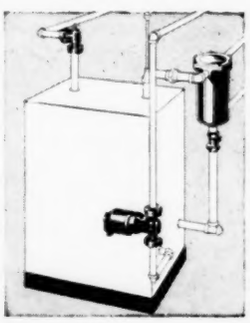


B & G INDIRECT HEATER

B & G FLO-CONTROL VALVE

B & G BOOSTER

B & G *Hydro-Flo* Heating equipment can be installed on any hot water boiler. Its simplicity is a warranty of dependable service-free operation. Send for descriptive literature.



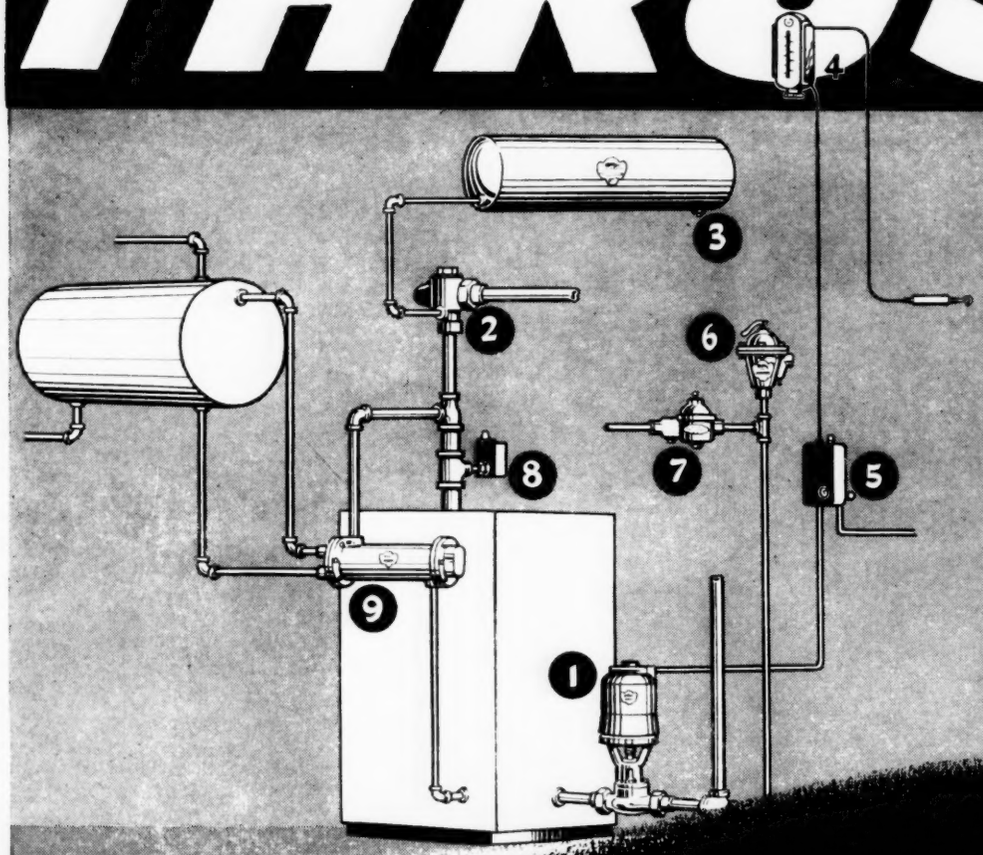
Hydro-Flo® HEATING

BELL & GOSSETT COMPANY

Dept. AK-4, Morton Grove, Ill.

*Reg. U. S. Pat. Off.

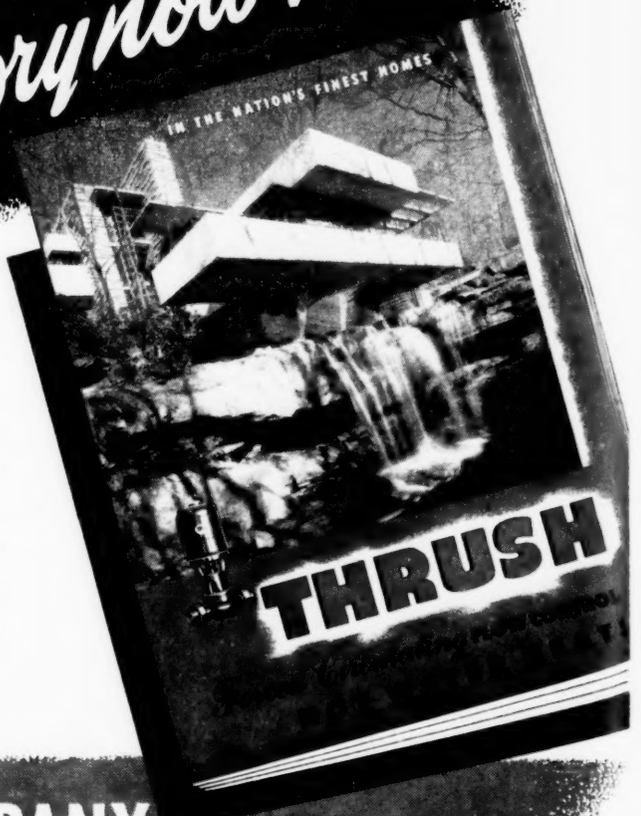
THRUSH



FORCED CIRCULATING, FLOW CONTROL SYSTEM OF HOT WATER HEAT

1. Water Circulator
2. Flow Control Valve
3. Pressure Tank
4. Radiant Heat Control
5. Relay Transformer
6. Water Pressure Relief Valve
7. Automatic Filling Valve
8. Boiler Water Temperature Control
9. Thrush Water Heater

GET the whole story now!



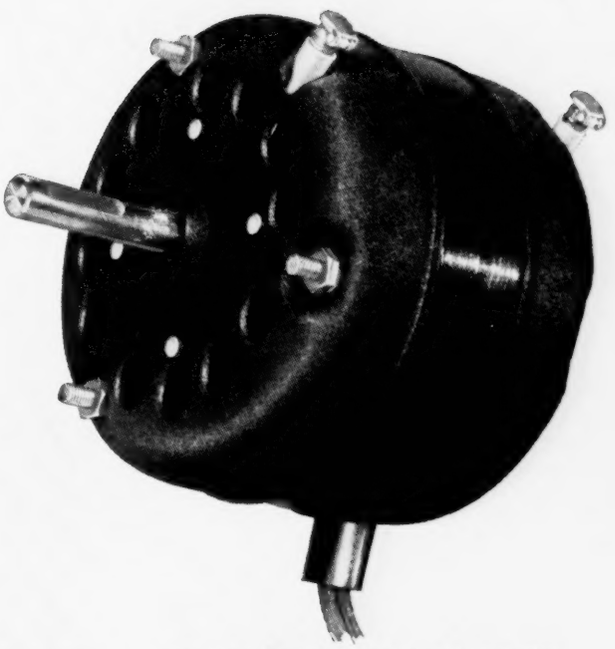
WRITE FOR your copy of this beautiful new booklet giving all the advantages of Forced Circulating Thrush Flow Control System. It is written to appeal to home owners and will help you sell more Thrush Systems. Installing this finest and most economical form of home heating will build your reputation and increase your business. Get all the facts now. Ask your wholesaler today or address Dept. D-2

H. A. THRUSH & COMPANY · PERU, INDIANA

DRIVE YOUR FANS

with alliance motors

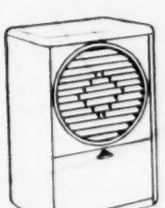
● It pays to use Alliance Fan Motors for *fans!* Mass produced at low cost, they're engineered for each job. Motors for continuous or intermittent duty can be supplied semi-enclosed or completely enclosed with oilers. Coming in different stack thicknesses to provide the right amount of power, the entire power range runs from about 1/400th h.p. up to 1/20th h.p. Also, speeds from 1550 rpm down to 500 rpm provide a versatile line of shaded pole induction motors designed for quiet, efficient operation —for economy and long life!



The New Model A shaded pole, induction type Alliance Fan Motor for speeds from 500 to 1050 R.P.M. operates on 50 or 60 cycles at voltages up to 220, 1/30th horsepower, size 4 4⅝ x 2¾ inches. Porous bronze, oilless type sleeve bearings. Open or fully enclosed construction. Approx. 8 to 40 oz. in. full load running torque, depending on lamination stacking thickness. Exceptionally quiet. For continuous or intermittent duty. Runs clockwise or counter clockwise—not reversible.

AIR CONDITIONER

AIR CIRCULATOR



ROOM HEATER

WHEN YOU DESIGN—KEEP

alliance motors

IN MIND

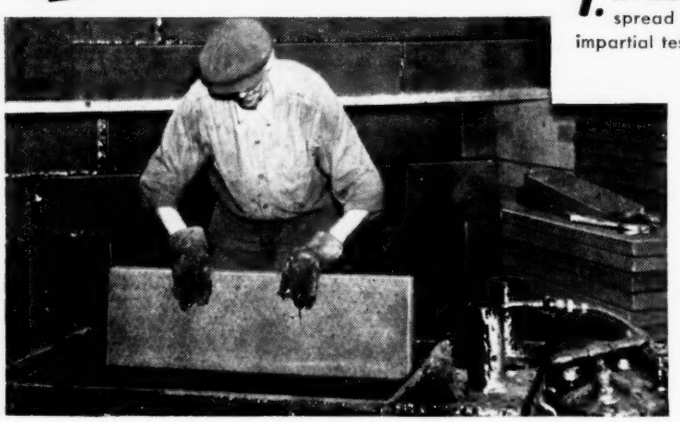
ALLIANCE MANUFACTURING COMPANY • ALLIANCE, OHIO

Export Department: 401 Broadway, New York 13, N. Y., U. S. A.

4 big reasons why it's KOLDBOARD for you!

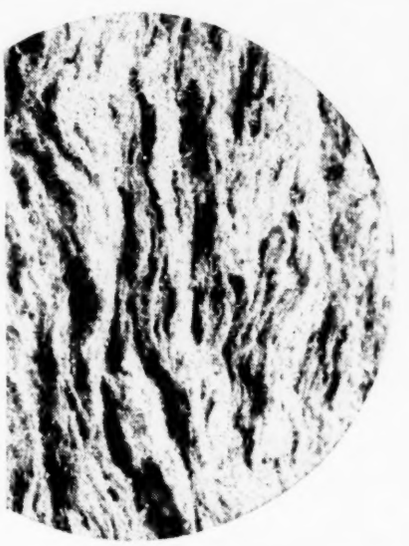
New developments have made a big difference in low temperature insulation. Get these facts before you buy. Learn why KOLDBOARD gives you more . . . saves you more.

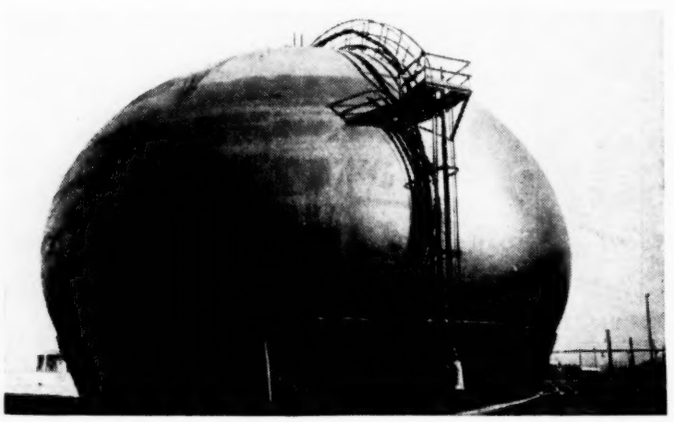
1. KOLDBOARD stops fire! Protect your investment with an insulation that retards the spread of fire. Koldboard won't burn even under the intense heat of a blow torch. By impartial tests, it retains 99.6% of its mass after 20 minutes at 1470° F.



2. KOLDBOARD is easy to install! These felted blocks of Baldwin-Hill *black* Rockwool are flat and rigid to go up quickly on walls—yet flexible enough for curved surfaces on large areas. Important too, asphalt is applied without absorption waste and resultant loss of insulating efficiency.

3. KOLDBOARD for high efficiency! Koldboard keeps low temperatures as you want them—thanks to a felted construction that holds millions of extra dead air cells. Thermal conductivity at 50° F., for example, is only 0.29 btu per square foot per hour per degree F.





4. KOLDBOARD is moisture resistant! Enemy No. 1 of insulation is infiltration of moisture vapor. But, this is no problem with Koldboard—even on outdoor installations. At Federal Specification test conditions, Koldboard shows moisture absorption of only 0.68%.

When you specify insulation for refrigerated plants—get the insulation that gives you ALL 4 BIG FEATURES—BALDWIN-HILL KOLDBOARD. It can be installed quickly, economically in either a new or an existing plant. High thermal efficiency means uniform temperatures, rock bottom operating cost. Best of all, it's insurance against fire. See for yourself why KOLDBOARD does such an efficient, economical insulating job.

Write for descriptive literature—today

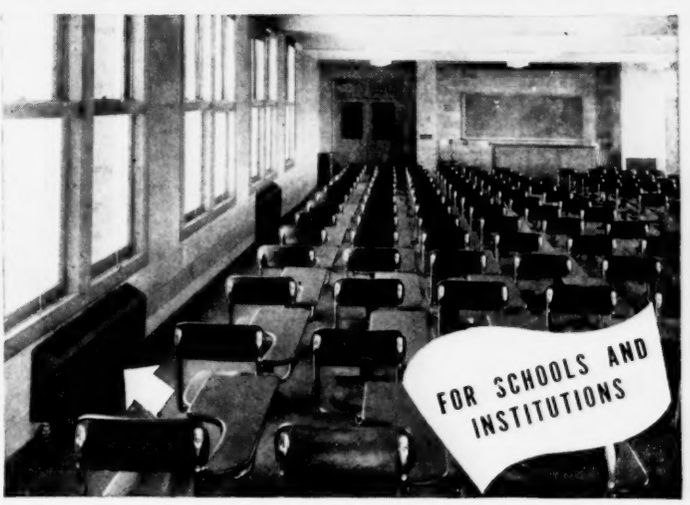
BALDWIN-HILL COMPANY
766 Breunig Avenue, Trenton 2, N. J.

a product of Baldwin-Hill

Koldboard BH

check them all and you'll buy

For Every Application
"STREAMAIRE" CONVECTORS
by YOUNG

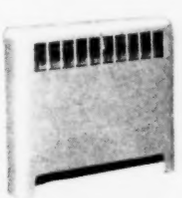


● An increasing number of architects and contractors are specifying "Streamaire" Convectors because they give extras that spell heating satisfaction. "Streamaire" Units are highly efficient and truly economical. They respond instantly to modern thermostatic controls . . . are engineered to circulate warm air by controlled convection, to level off temperature peaks by natural radiation. "Streamaire" Convectors are easy to specify, easy to install because they're standardized in four types, packaged individually to prevent damage. To aid quick identification, cartons are clearly marked with model number and size. "Streamaire" Cabinets, painted to harmonize with any interior, enhance the beauty of modern decorative themes. For convenience, fronts are removable for cleaning.

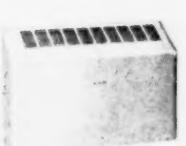
SEND FOR FREE CATALOG NO.4046

Have you sent for your copy of the new "Streamaire" Convector Catalog? It will give you up-to-date details on the Young line and it includes ratings, specifications and other helpful data.

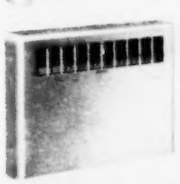
FOUR "STREAMAIRE" STYLES MEET EVERY NEED



◀ FREE STANDING, Type C—Saves on installation costs—no wall recesses are required.



WALL HUNG, Type ▶ WS—Sloping top grille prevents careless blocking of air circulation.



◀ WALL HUNG, Type W — Heating element accessible by easily removed one-piece panel.

PARTIALLY RECESSED, Type S—Special "Z" bars permit installation before or after plastering. ▶

YOUNG
HEAT TRANSFER PRODUCTS

Young Quality

YOUNG RADIATOR CO.
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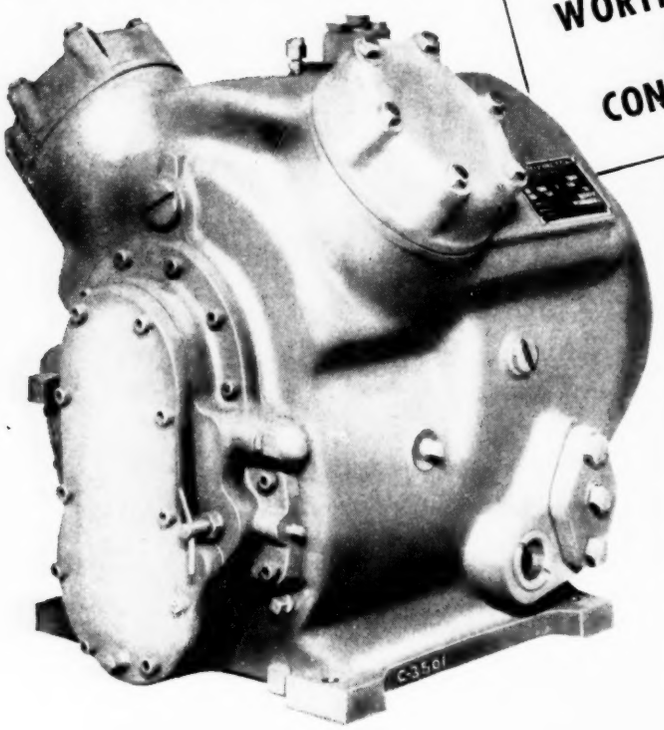
AUTOMOTIVE AND INDUSTRIAL PRODUCTS

Gas, gasoline, Diesel engine cooling, radiators • Jacket water coolers • Heat exchangers • Intercoolers • Condensers • Evaporating coolers • Oil coolers • Gas coolers • Atmospheric cooling and condensing units • Supercharger intercoolers • Aircraft heat transfer equipment

HEATING, COOLING AND AIR CONDITIONING PRODUCTS

Convectors • Unit Heaters • Heating coils • Cooling coils • Evaporators • Air conditioning units •

This *NEW* Hermetically-Sealed COMPRESSOR



Makes This WORTHINGTON AIR CONDITIONER

the Outstanding SELF-CONTAINED Unit

It's the most modern of its kind—completely new, designed throughout for quiet, vibrationless operation and field serviceability.

Motor and compressor are combined in one piece of equipment (eliminating belts, pulleys, fly wheels and couplings) and hermetically sealed against dirt and moisture. There are no shaft seals, and it is never necessary to oil the motor or make adjustments. When necessary, the equipment is readily accessible for servicing in the field.

Other features: dynamically balanced crankshaft, crankcase with removable cover, positive displacement gear-type oil pump, large oil filters in the lubricating oil line, pistons equipped with four piston rings, removable cylinder liners, Worthington Feather* Valves, refrigerant-cooled cylinder walls and refrigerant-cooled motor.

Models are available now in 3-ton and 5-ton sizes.

Get ahead with Worthington's Self-Contained Air Conditioner—the air conditioner with *all* the new features, that's going out front in 1948. *Worthington Pump and Machinery Corporation, Harrison, N. J. Specialists in air conditioning and refrigeration for more than 50 years.*

*Reg. U. S. Pat. Off.

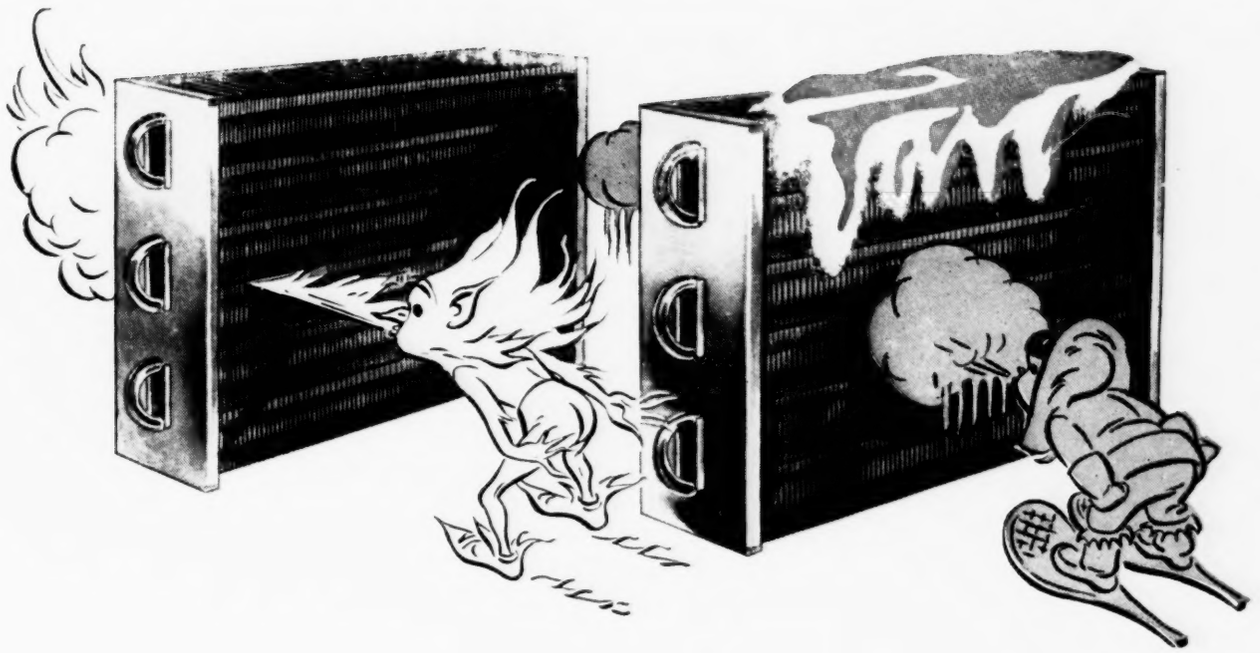
SEE IT AT
International Heating and Ventilating Exposition — Worthington Booths 30-31 and 44A-45.

WORTHINGTON

AIR CONDITIONING AND REFRIGERATION

A-7-27

Whether it's WARMING or COOLING



you've got to move HEAT

Alcoa Aluminum gives faster heat transfer

Manufacturers of heating, air conditioning, and refrigeration equipment find that Alcoa Aluminum is often the answer to a heat-transfer problem. Aluminum moves heat *fast*.

And they have found the easy formability and castability of lightweight aluminum important in designing compressor parts, heat exchangers, cooling fins, ventilating ducts, and other equipment. In freezing and refrigeration equipment aluminum is used for box liners, evaporators, accumulators, and tubing in home and commercial units. Aluminum is sanitary and friendly to food.

Alcoa Aluminum is easy to fabricate in a variety of ways, is lightweight, non-rusting, attractive, and easy to maintain—combines these characteristics with high thermal conductivity. For advice on the use of aluminum, call your nearby Alcoa office, or write ALUMINUM COMPANY OF AMERICA, 1471 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

IN EVERY COMMERCIAL FORM

for every Heating, Ventilating and Air Conditioning System DUX-SULATION PERFORMS NOT 1 but 9 Jobs

at No Additional Cost—

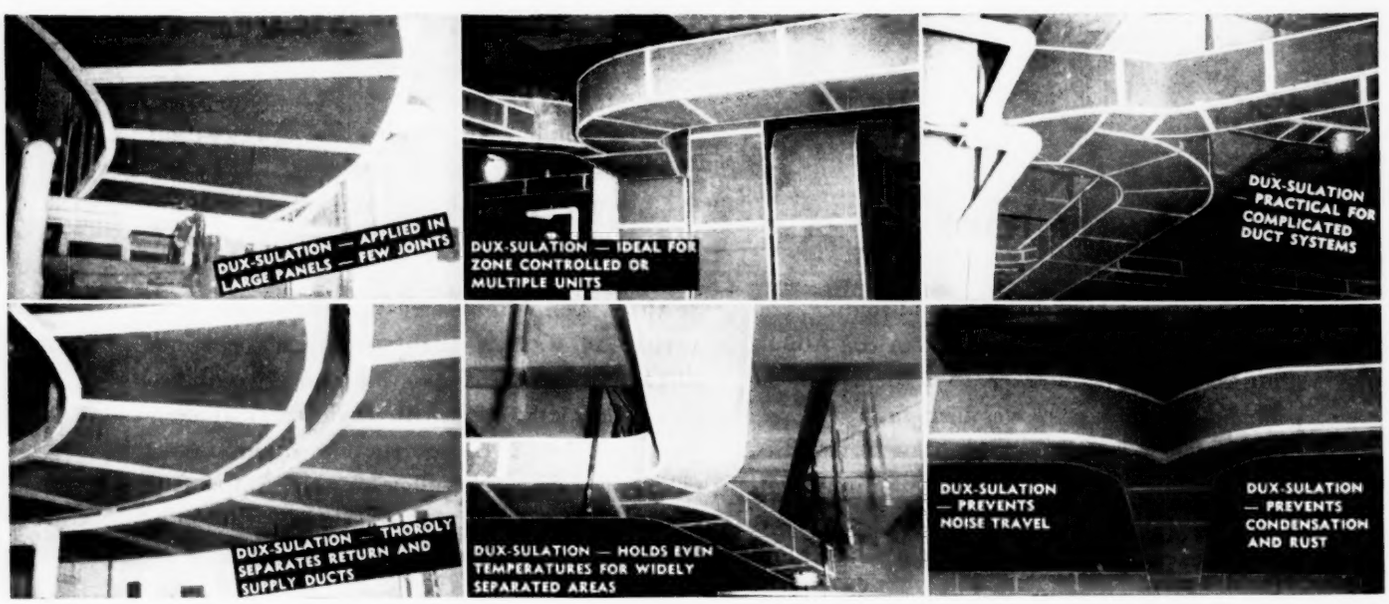
Asbestos protected DUX-SULATION, the all-purpose insulation, has 9 definite purposes. They are listed at the right. When you buy insulation for ducts, YOU buy it primarily to accomplish some one of the 9 results, but when you buy DUX-SULATION, you also get the ADDITIONAL 8 benefits automatically and at no additional cost.

Each and every one of these functions of DUX-SULATION are important to you, so when you consider that you get ALL 9 combined in one product, you cannot afford to buy any insulation for ducts that accomplishes less.

Throughout the nation, Engineers and Heating Contractors are stepping up the performance of their jobs through using this money-saving, waste-eliminating, comfort-giving and easy-to-apply insulation.

Available for prompt shipment. . . . Write for Bulletin

- SAVES FUEL
- DEADENS METALLIC NOISE
- PREVENTS RUST
- ABSORBS SOUND
- REDUCES POWER LOAD
- PREVENTS CONDENSATION
- IMPROVES APPEARANCE
- REDUCES VIBRATION
- OFFSETS OVERLOADS


DUX-SULATION — APPLIED IN LARGE PANELS — FEW JOINTS
DUX-SULATION — IDEAL FOR ZONE CONTROLLED OR MULTIPLE UNITS
DUX-SULATION — PRACTICAL FOR COMPLICATED DUCT SYSTEMS
DUX-SULATION — THOROLY SEPARATES RETURN AND SUPPLY DUCTS
DUX-SULATION — HOLDS EVEN TEMPERATURES FOR WIDELY SEPARATED AREAS
DUX-SULATION — PREVENTS NOISE TRAVEL
DUX-SULATION — PREVENTS CONDENSATION AND RUST

DUX-SULATION is a flexible insulating blanket, made ½" and 1" thick. It is put up in an easy-to-handle Roll, 36" wide, containing 100 square feet. Special adhesive for securely cementing the blanket onto the metal and Asbestos-faced Tape for covering the joints and corners, comes with each Roll.

You and your customers will benefit by getting the full story told in our valuable Bulletin No. 402-V. Write today.

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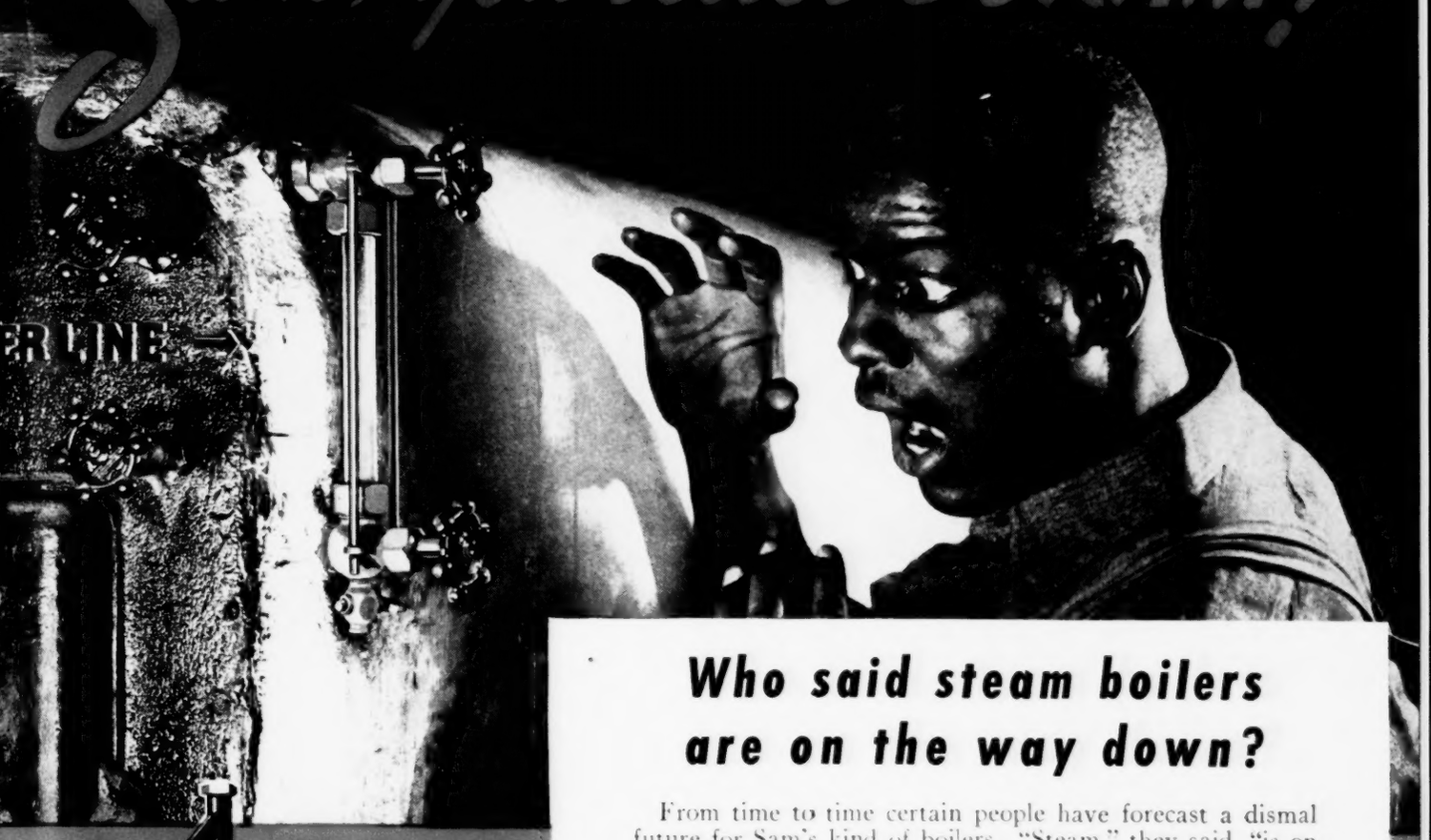
GET THAT BONUS OF "8" EXTRA SERVICES BY ORDERING DUX-SULATION FROM YOUR LOCAL SUPPLY HOUSE

THROUGHOUT CANADA — Atlas Asbestos Co., Ltd., Montreal — Toronto — Winnipeg — Vancouver

Sam, you better SCRAM!



Who said steam boilers are on the way down?

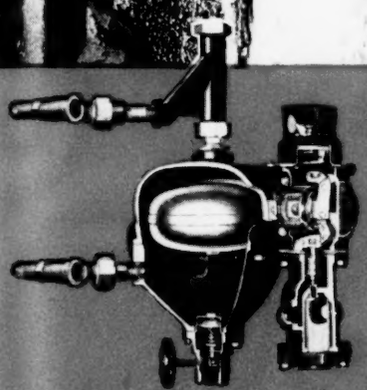
From time to time certain people have forecast a dismal future for Sam's kind of boilers. "Steam," they said, "is on the way out!" Now that we have some statistics in the heating industry, it's surprising to see how wrong they are.

Note, for example, that the latest figures from I-B-R show that 41.8% of the cast iron boilers shipped during the first six months of 1947 are steam. Instead of being on the way down, the steam percentage has *increased* over 1946 figures! This isn't accounted for by big boilers either. Small boilers showed a higher percentage than at any time since the records were kept: 55.9% of the steam boilers shipped were under 550 feet.

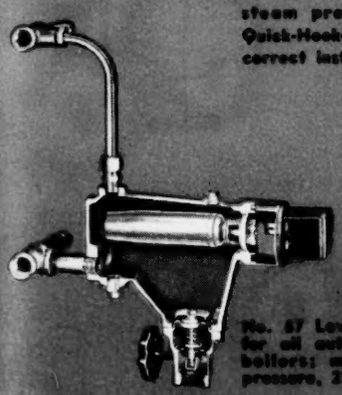
Note also that R. E. Perry of the I-B-R gives facts in a recent article that enable you to translate these percentages into boilers. He says cast iron boiler replacements can be expected at a rate of 100,000 annually, confirmed by the fact that there are over 4 million in service with an estimated life of 40 years (F.H.A. figures).

In terms of business for you, this means there will be about 41,000 steam boilers for replacement alone. All of them need McDonnell Boiler Water Level Controls. More than half of them (57.9%, says I-B-R) will be automatically fired—all ready-made prospects for the McDonnell No. 47-2 and No. 67 illustrated here. On top of this you have the boilers for new buildings and the millions of old boilers that need protection to insure their full life span. A lot of them are in your locality. Surely you'll go after your full share. Ask for latest sales helps, information and prices.

McDONNELL & MILLER, INC., 1343 Wrigley Bldg., Chicago 11, Ill.



No. 47-2 Feeder-Cut-off Combination for boilers below 5000 sq. ft.; maximum steam pressure, 25 lbs. Quick-Hook-Up for speedy, correct installation.



No. 67 Low Water Cut-off for all automatically fired boilers; maximum steam pressure, 25 lbs.

No. 158 Water Level Control for boilers of any size with steam pressures up to 150 lbs. Used as feed-pump control; low-water fuel cut-off; low water alarm switch, or any combination of these functions.

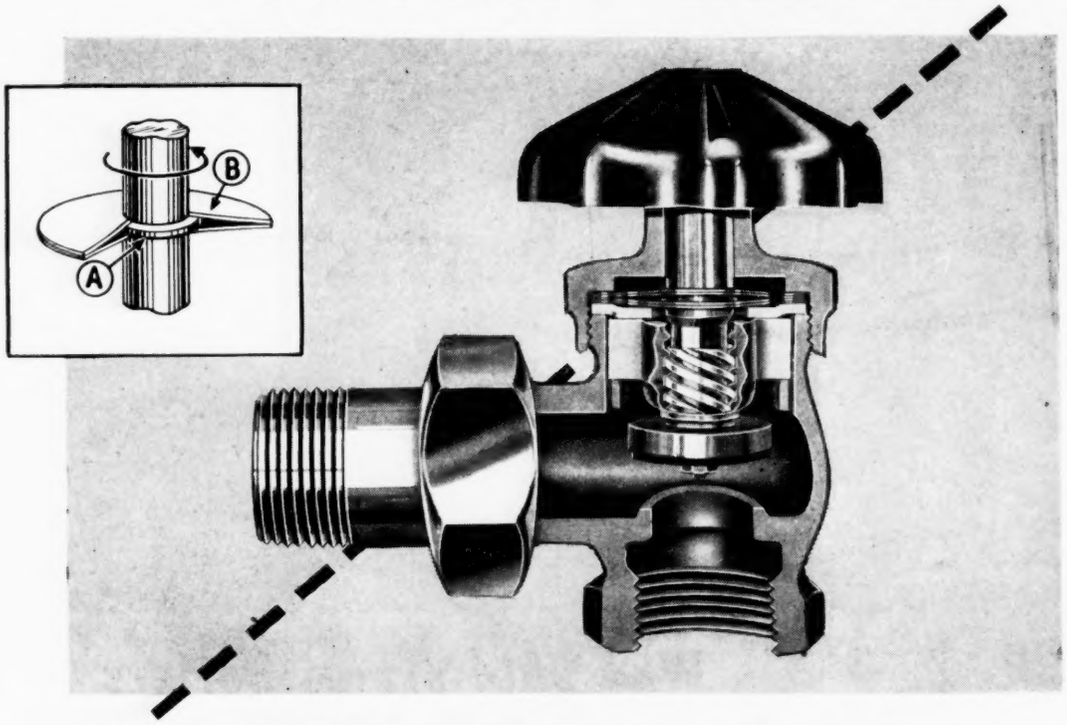
Doing One Thing Well

Your Jobber Knows Them

McDONNELL

Boiler Water Level Controls

A Valve that is



PACKLESS in fact

. . . not just packless in name

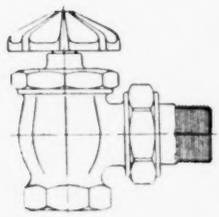
When the job calls for the kind of valve that will stand up across the years —when it calls for a valve that is packless in the full meaning of the word— then, no matter how far you look, you'll find in the Marsh Packless the only valve that completely fills the bill.

In fact, many users consider this the only valve that is packless in fact as well as in name, and they have a good reason for this. There is a difference between pack less and packless! The diagram tells the story of Marsh truly packless construction. A collar (A) is machined on the valve stem. The stainless spring steel wafers (B) press against this collar to form a tight annular seal This, you see, is a metal-to-metal seal—*permanently* leakproof.

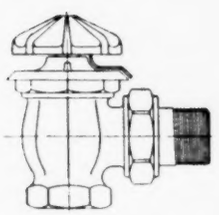
And this better construction is typical of the quality and refinement found throughout the Marsh Packless Valve—in the swivel, self-seating, self-cleaning disc—in the excellent proportioning, machining, workmanship and finish.

Packed valves can and do "blow out", scalding or burning the operator. This danger is avoided when you use the Marsh Packless. It is a valve you can rely on for any service up to 100 lbs. Furnished in a wide range of patterns including graduated and extended stem types, the Marsh Packless Valve is widely used for steam and hot water heating systems, coffee urns, steam kettles, sterilizers, ovens and similar services. Ask our representative or engineering department for facts.

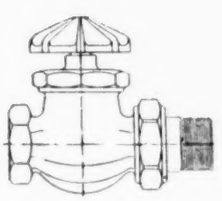
MARSH HEATING EQUIPMENT CO.
Division of
JAS. P. MARSH CORPORATION, (Dept. U), SKOKIE, ILLINOIS



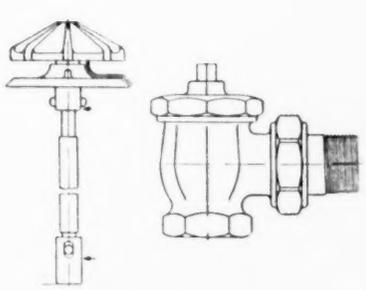
Wheel Angle



Wheel Angle Graduated



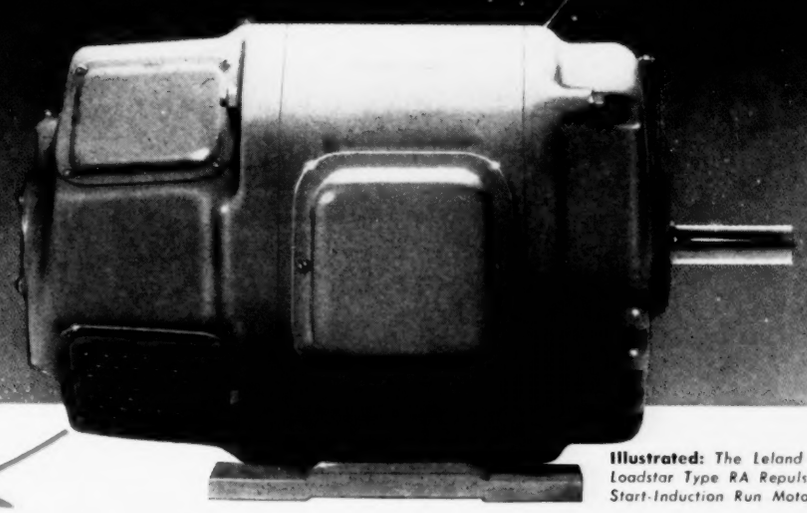
Globe



Extension stem

MARSH SINCE 1865
Quality Heating Specialties

Hitch your Product to a Leland LOADSTAR



Illustrated: *The Leland Loadstar Type RA Repulsion Start-Induction Run Motor*

PICKUP! *Higher starting torque per ampere of starting current characterizes Type RA Repulsion start-induction run motors.*

QUIET! *Exceptionally close tolerances eliminate vibration, prolong motor life. Engineered throughout for smooth, silent operation under most exacting conditions.*

SELECTION! *⅓ to 5 HP. Types—ball bearing and sleeve bearing; open and enclosed; explosion-proof; horizontal and vertical.*

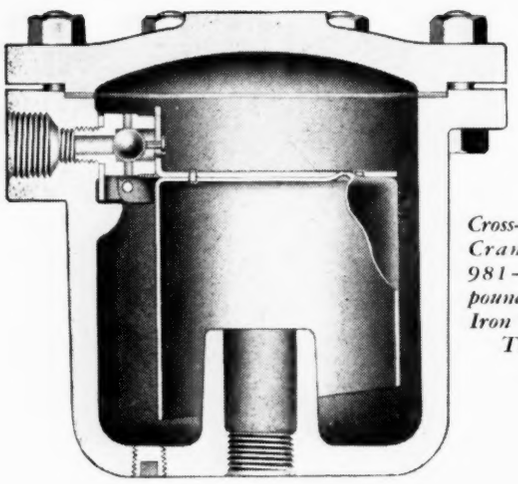
TOGETHER, they'll go far. If your product, too, stands for down-to-earth engineering aimed at standards raised sky-high, then you'll find your performance values enhanced by similar characteristics in the Leland Loadstar. Sales-wise, too, you'll find the nameplate on your Loadstar a potent business beacon. Your customers, who have long known Leland, find in Leland Loadstars the coolest-running, sweetest Lelands yet . . . Specify Loadstar for HP per cubic inch as high as any—for HP per pound higher than most. *Write for descriptive literature.*

THE LELAND ELECTRIC COMPANY, DAYTON 1, OHIO. ***Branches in all principal cities.***

LELAND *LOADSTAR* MOTORS

MOTORS OF ALL TYPES—ENGINEERED TO INDUSTRY'S SPECIFIC NEEDS

A Steam Trap With Only One Moving Part



Cross-section Crane No. 981—150-pound Cast Iron Steam Trap

Float Actuating the Disc through Simple Lever is Only Moving Part

Extremely simplified and compact design with unusually high discharge capacity. Assures efficient drainage of all steam piping and steam heated equipment. Saves fuel . . . keeps steam hot and dry. Works automatically . . . requires practically no maintenance. Extra strong and wear-resisting construction throughout. Easy to install and service.

WORKING PRESSURES AND SIZES: 1 to 150 pounds saturated steam, in ½-in. size only—1 to 200 pounds, from ½ to 1-inch incl.—50 to 300 pounds, in ¾ and 1-in. sizes. See your Crane Catalog, or

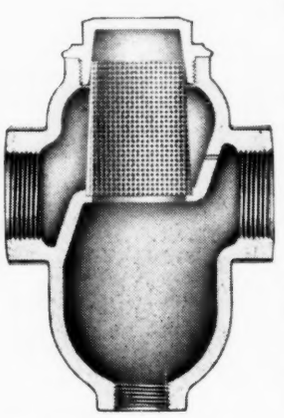
WRITE FOR DESCRIPTIVE BULLETIN AD-1610

How Much Is Dirt in Pipelines Costing You?

. . . Stop this 2-way waste with

CRANE SEDIMENT SEPARATORS

The cutting action of dirt and scale in any pipeline is a menace to valve and trap life. In lines to automatic machines, foreign matter may be the cause of frequent shutdowns, or of high product spoilage.

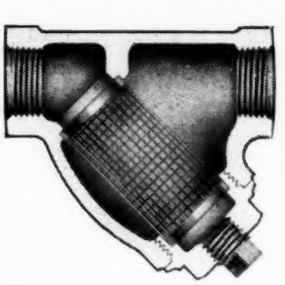


Cross-Section Standard Type

WORK AUTOMATICALLY —EASY TO SERVICE

Crane Sediment Separators automatically trap and remove all dirt from pipelines. Extra large screening areas assure free fluid flow and minimum pressure loss. Only periodic emptying of sediment pocket is required. Crane design permits easy cleaning out and replacement of screen.

Cross-Section Y-Pattern



FOR HIGH OR LOW WORKING PRESSURES

A wide range of sizes in several types in iron and steel, with screwed or flanged ends, assures a Crane separator for most needs. All types supplied with screen of mesh and material best suited for service specified. See your Crane Catalog or

WRITE FOR DESCRIPTIVE BULLETIN AD-1638

CRANE CO., *General Offices,* 836 South Michigan Avenue, Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

EVERYTHING FROM . . .

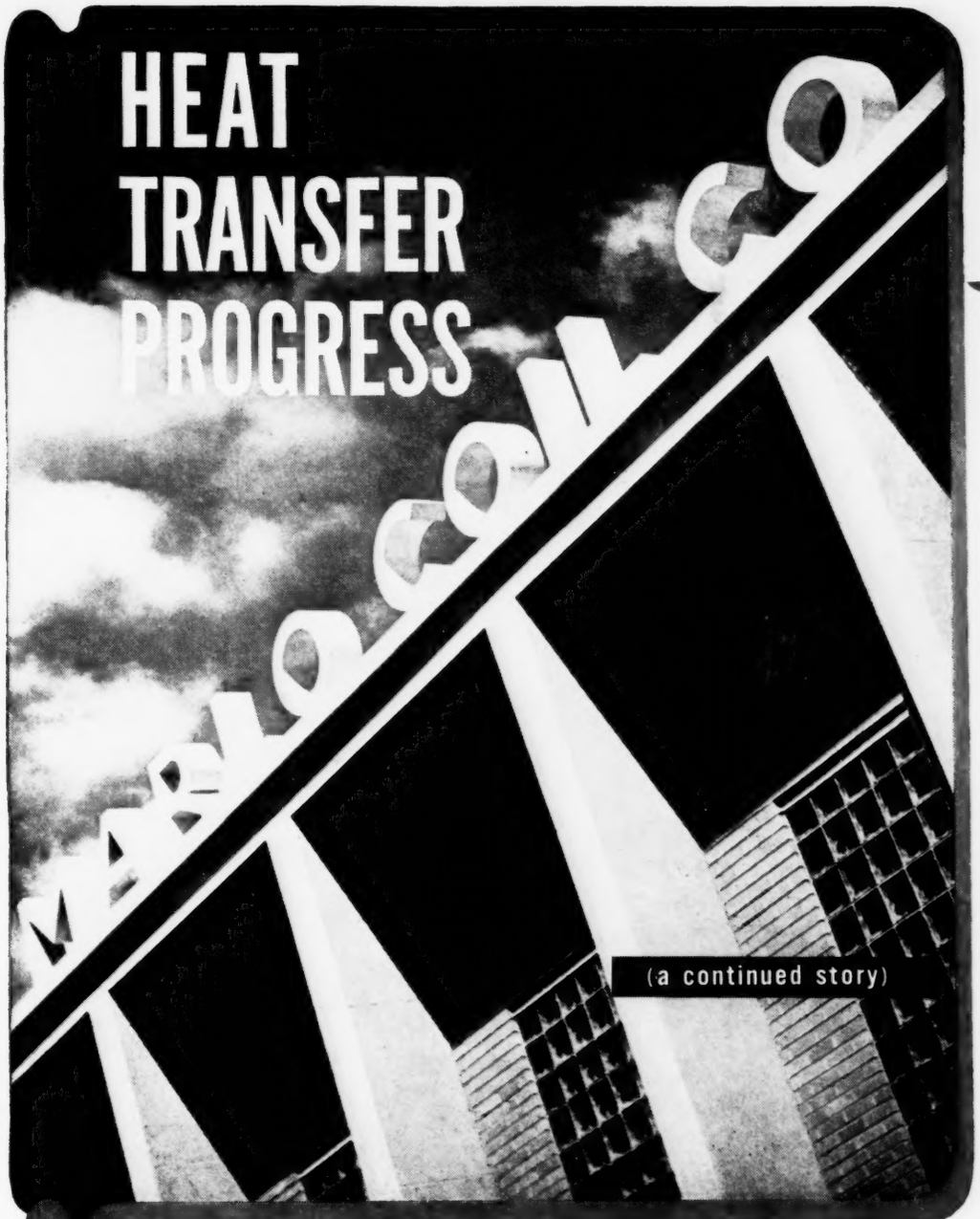
VALVES
FITTINGS
PIPE

CRANE

PLUMBING AND HEATING

FOR EVERY PIPING SYSTEM

HEAT TRANSFER PROGRESS



(a continued story)

- Behind this modern exterior stands one of the most progressive plants in the industry. Here Marlo coordinates efficient manpower, methods and machines into ever higher quality, lower cost production. Result: more and more value for your heat transfer dollar.
- In this series of messages we'll take you "behind the scenes" to show you why . . .

Marlo IS THE MARK OF HEAT TRANSFER PROGRESS

MARLO = HEAT TRANSFER
Since 1995

MARLO COIL CO. / ST. LOUIS 10, MO.

STAYNEW *automatic* AIR FILTER

Engineered for Greatest Possible Efficiency and Economy . . .

THIS latest model Staynew Automatic Filter operates on the principle of dust impingement. Dust is caught by moving filter panels moistened with oil from a reservoir. The panels are automatically timed to operate at pre-determined intervals, depending on the amount of dust to be removed and the air velocity. The filter possesses a number of unusual features which increase efficiency in dust removal and reduce operating costs. Several of these features are fundamental in design and found in no other filter. The result is a rugged, high-efficiency unit with which extremely large volumes of air can be filtered at low cost.

A. Quickly demountable panel sections. Filter medium is special woven mesh, wire cloth protected. This medium, moistened with oil, presents a maze of small, finely divided, irregular orifices which break up the air stream. Dust particles are impinged on the sides of these orifices.

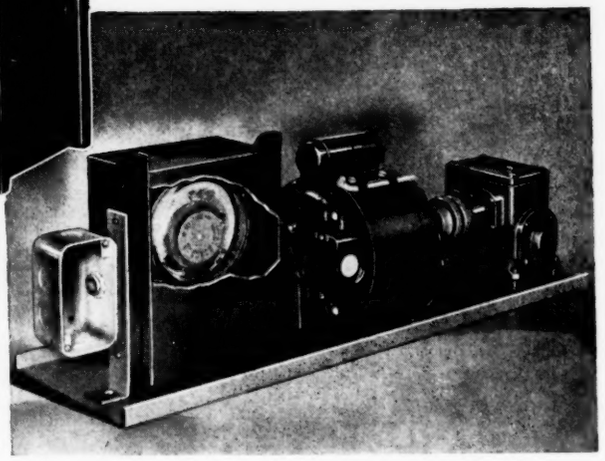
B. Virtually friction-free construction. Ball bearings throughout. Roller bearing chains carry filter panels. Both panels of a 13 ft. unit may be easily turned with one hand!

C. Absolutely rigid one-piece pressed channel side plates.

★ There are two series of endless moving filter panels. Each series provides two stages of filtration —four stages in all. The double series of moving filter panels is exclusive with Staynew. Efficiency is two-fold.

★ Direction of curtain travel is such that air leaves the clean side always. This is an exclusive feature.

CONTROL MECHANISM INTEGRAL PART OF FILTER UNIT . . . *Just one connection to be made to electric line.*



Telechron motor-driven time switch with silver contacts. Time switch is mounted in a glass dust-proof case. Power transmission from sturdy rubber-mounted motor through 400-1 gear box and 3-1 chain and sprocket. Every gear, pinion, bearing, roto timing device, panel section, side-piece —in fact, every major and minor detail of this filter is of the highest possible quality—designed for efficiency, long wear and complete satisfaction.

WRITE FOR FULL INFORMATION.

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

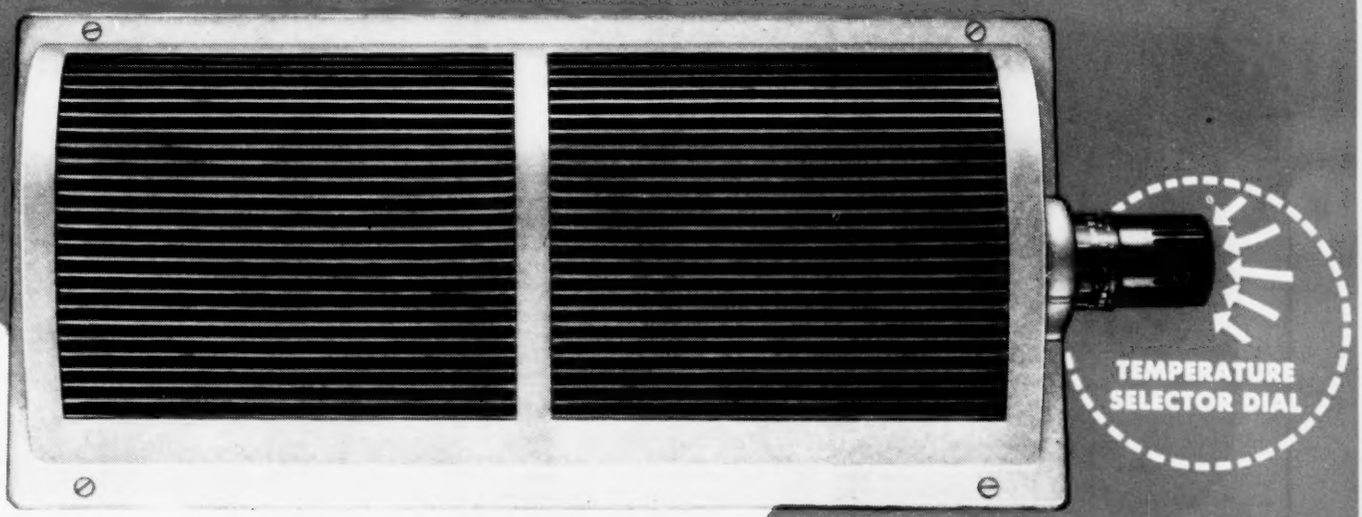
DOLLINGER CORPORATION

15 CENTRE PARK ROCHESTER 3, N.Y.

"AIR FILTER HEADQUARTERS"

KNOCK-OUT NEWS

THE SENSATION OF THE NEW YORK HEATING SHOW



PATENTS PENDING

Individual Room Temperature Control—AUTOMATICALLY

The New **DOLE**

THERMO-MATIC

(REG. U.S. PAT. OFF.)

REGISTER

for Forced Warm Air Heating Systems

- Operates thermostatically from room air.
- Very sensitive: Modulating effect: Output is regulated to meet heat losses.
- Completely self-contained; no wires to run —no bulbs to locate—very simple to install.
- Simple setting of the thermo-dial assures room temperature control — as desired — corrects many unsatisfactory heating installations: Materially improves any forced warm air system.
- A zone control for every room.

DOLE manufactures AIR and VACUUM VALVES for heating systems and WATER MIXERS for domestic use

The Dole Valve Company
1933E Carroll Avenue
Chicago 12, Illinois

Please send me facts about the new DOLE THERMO-MATIC Register for forced warm air heating systems.

NAME_____

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ADDRESS _____

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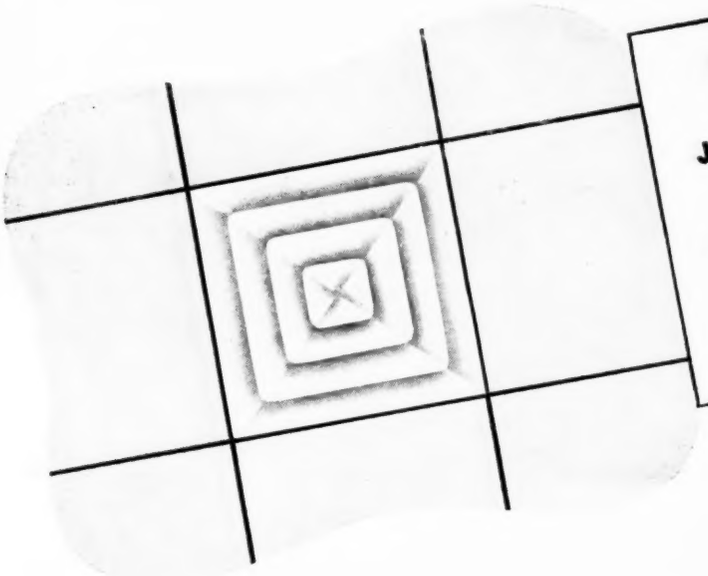
Post Yourself
ON THIS NEW DEVELOPMENT
SEND THE COUPON NOW

Another Building with ACOUSTICAL CEILINGS

Another Building with AGITAIR TYPE R



LARGEST OFFICE BUILDING IN NEW ENGLAND

John Hancock Mutual Life Insurance Co.
Boston, Mass.

Architects — Engineers:
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Contractors:
Turner Construction Co.

Heating, Ventilating, & Air Conditioning Contractors:
Buerkel & Co., Inc.

It's The Only Air Diffuser Especially Designed For ACOUSTICAL CEILINGS

Ever wonder why you see so many acoustical ceilings with Agitair Type R? Here's the answer: Agitair Type R is the only air diffuser made in standard sizes to fit every acoustical ceiling.

It provides perfect blending with the ceiling pattern . . . eliminates costly on-the-job cutting and trimming of tile . . . saves installation time and money. And, of course, Agitair Type R gives you 100% control of air distribution . . . with no noise, no drafts, no blank corners, no hot spots, no cold spots.

Look around — at big jobs and small ones — chances are wherever you find acoustical ceilings you'll find Agitair Type R.

Write for Complete Data

AIR DEVICES, Inc. • **17 East 42nd Street** • **New York 17, N. Y.**

CEILING AIR DIFFUSERS AIR FILTERS ROOF EXHAUSTERS

SECRETARY OF INTERIOR ASKS PUBLIC TO CUT OIL AND GAS USE 15%
Warning Shortages May Last 3 Years
Home Owners To Keep Temperature To
Reduce A
OIL BURNER BUYING RISKY, PUBLIC WARNED
Oil Situation May Last 4 or
Gasoline Shortages May Affect Harvesting
The Director of the Oil and Gas Division of the Interior Department said today that gasoline shortages may hinder harvesting in the Mid-Western area. He
Predicts Shor
WASHINGTO
Secretary of t
said home bu
oil furnaces d
risk under pres
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He testified
Banking Comm
the administr
ago,
tankers could tak
England.
THE PRESIDEN
The text of the P
was as follows:
"To the heads of
and independent ag
"I hereby direct
immediately, each
agency of the Gove
and enforce the
applicable to all
equipment which
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uses fuel oil or g
uses gas in areas
gas is not in abun
cept where full a
ance would impa
health or safety.
"1. Office buil
establishments sh
above 68 degrees
work and shall
this temperature
cable throughou
After work hou
not be heated
The only except
establishments whose operations
require a higher temperature.
Buildings without zone control an
areas difficult to heat without
raising the temperature of the en
tire building shall be studied to
determine the necessary mechani-
He admitted that stepping up present production 40% without synthetics was virtually impossible because the domestic oil output in 1947 was but 7% over 1946.
Pleading that oil was the blood" of our military mach
the Secretary said in the next
king and Currency Committee
told that in the last nine
ths there was a rise of 30 per
Washington, D. C., Jan. 19.—Secreta
restal warned today that the U. S. is so sho
came tomorrow we would need 2,000,000
tion of grain
His decisio
after the meet

What good is a building without enough heat?

TENANTS may put up with the heating emergency this winter without too much grumbling.

But how about next year, and the next, and maybe other years? Property can be impaired and rentals imperilled in buildings without heat.

Fortunately, there is plenty of anthracite, the hard coal that stores without degradation or danger of spontaneous combustion.

Anthracite cannot smoke under any condition of use and, therefore, can never violate a smoke ordinance. Large buildings can use the cheaper sizes of hard coal, giving savings up to 50% compared to fuels in short supply today.

* * *

If you wish to prevent your building from becoming a "fuel orphan," investigate modern methods of using anthracite.

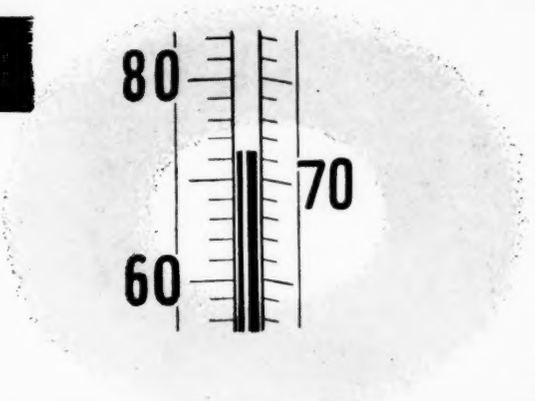
ANTHRACITE INSTITUTE

ANTHRACITE INSTITUTE

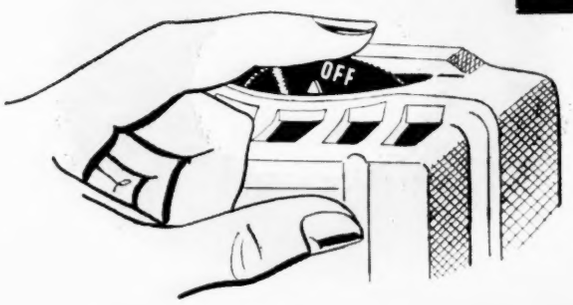
101 PARK AVENUE • NEW YORK 17, NEW YORK

AUTOMATIC CONTROL

The PENN Unit Heater Thermostat embodies the famous PENN principle of "heat anticipation." By "sensing" changes before they occur, this thermostat automatically holds temperatures within close limits, avoids wide swings and over-runs, assures continuous comfort and helps to save fuel.

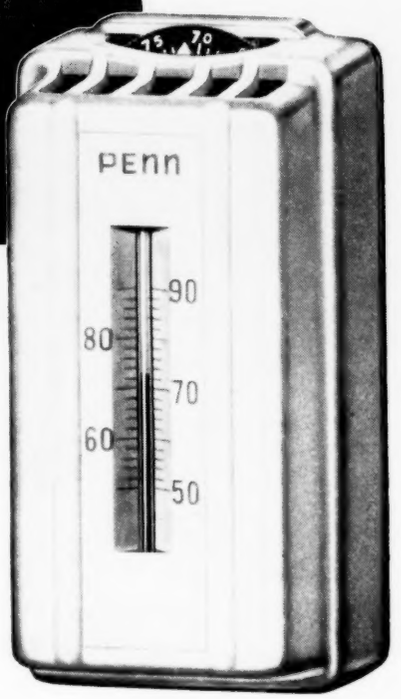


plus MANUAL CONTROL



Simply turning the calibrated dial to "off" position shuts off the heater to save fuel during idle periods or in cases where heaters are located near outside doors which may be open for long periods. Turning the calibrated dial to "on" position enables continuous fan operation for summer ventilation . . . just another "plus" feature of this PENN Control.

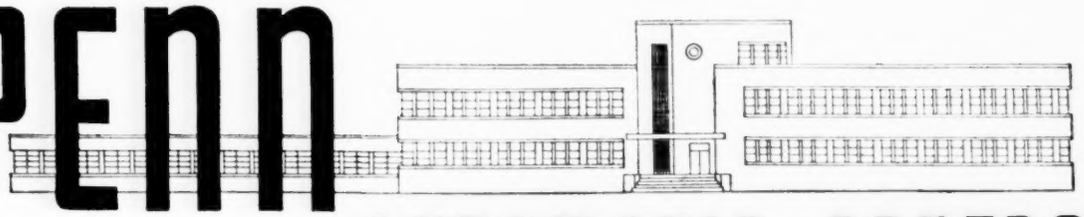
Get *BOTH* in the PENN Unit Heater Thermostat



THE BUILT-IN "on-off" switch and the heat anticipation feature are typical of the engineering advancements in the complete PENN line of Automatic Controls—for heating, air conditioning, refrigeration, pumps and air compressors. All are precision-built for long-life accuracy. The type of switching structure and rugged construction assure dependable service under severe conditions.

Consult PENN, without obligation, about your control application problems. Our engineers are qualified to give dependable, practical advice and assistance. **Penn Electric Switch Co.,** Goshen, Indiana. Export Division: 13 E. 40th St., New York 16, U.S.A. In Canada: Penn Controls, Ltd., Toronto, Ont.

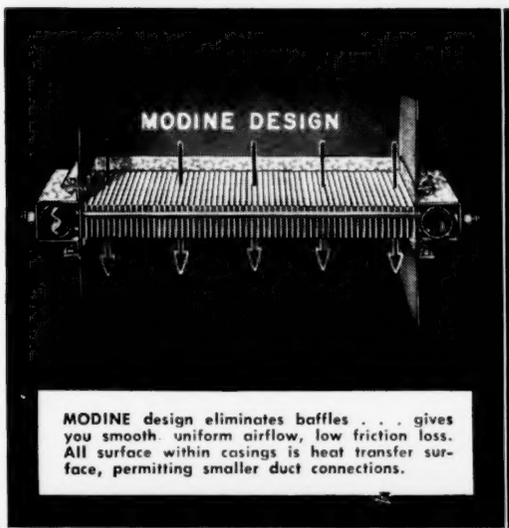
PENN



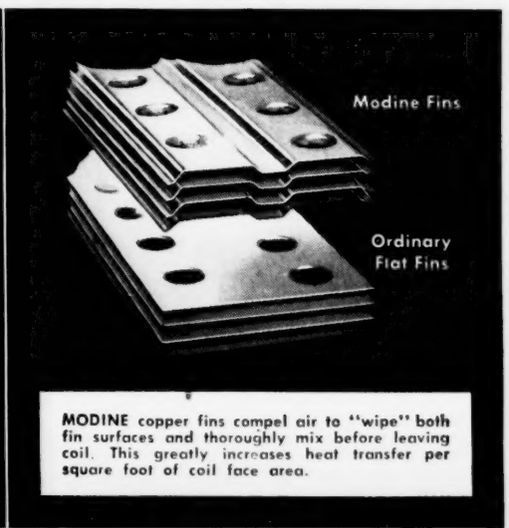
AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, ENGINES, PUMPS AND AIR COMPRESSORS

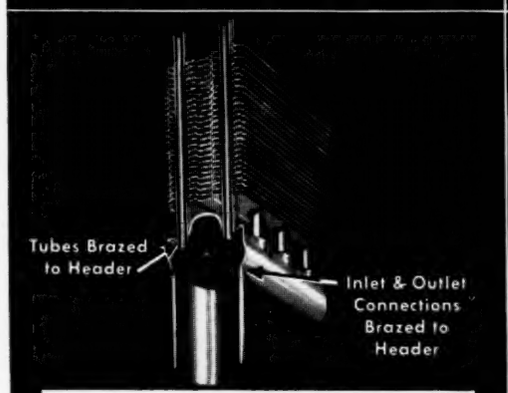
NEW MODINE COILS GIVE YOU BIG, NEW BONUS FEATURES!



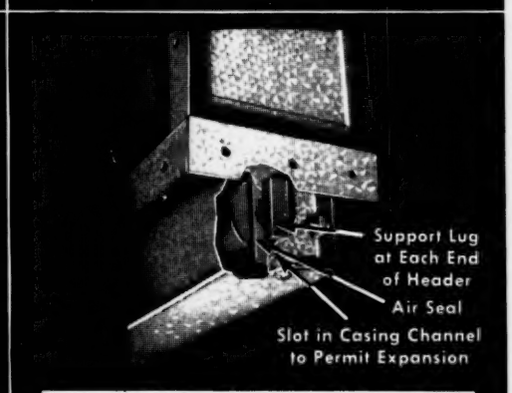
MODINE design eliminates baffles . . . gives you smooth, uniform airflow, low friction loss. All surface within casings is heat transfer surface, permitting smaller duct connections.



MODINE copper fins compel air to "wipe" both fin surfaces and thoroughly mix before leaving coil. This greatly increases heat transfer per square foot of coil face area.



MODINE copper tubes and piping connections are brazed to headers under controlled time and temperature conditions. Result — a pressure-resisting assembly, no mechanical joints.



MODINE floating condenser principle permits coil to "grow" as it expands, retreat to normal size as it contracts . . . gives you full protection against expansion stresses, fatigue and fracture.

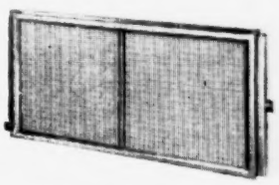
Step Ahead With Modine Coils!

Important Modine design improvements give you better performance, greater structural strength and easier installation at no extra cost. Check the many plus-features . . . note the top quality construction . . . and you'll see why it pays to specify the new Modine Heating Coils.

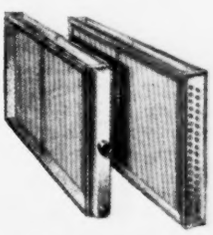
Get all the facts about Modine Heating Coils. Write on your letterhead for new 48-page catalog No. 348, or call the Modine Representative listed in the "Where-to-Buy-it" section of your phone book. *Modine Manufacturing Co., 1511 Dekoven Avenue, Racine, Wisconsin*

Modine HEATING COILS

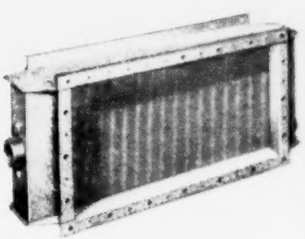
Four Types, 1236 coils to choose from!



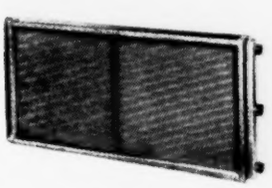
STANDARD COILS
595 individual coils



NON-FREEZE COILS
510 sizes and models



BOOSTER COILS
46 different sizes



HOT WATER COILS
85 individual coils

NEW CATALOG READY NOW

Order your copy!

ACME PRODUCTS

ENGINEERED FOR *Performance*

Wherever heavy-duty refrigeration or air-conditioning equipment is used—ACME products meet all requirements. Acme's major component parts are in successful operation everywhere. Wide variety of shell or tube diameters available permits selection of the size unit best suited for your requirements without sacrificing performance for price.

1. FREON CONDENSERS AMMONIA CONDENSERS
Shell and tube type for use with FREON, Ammonia, and other refrigerants. Standard and also special designs for varying water temperatures available and condensing temperatures desired. A complete line.

2. DRY-EX COOLERS
For chilling water in large volume. Refrigerant flows through tubes, solution baffled through the shell. Baffle spacing controls water flow. Cooling by direct expansion of refrigerant.

3. HEAT EXCHANGERS
Shell and tube models for large installations, shell and coil models for smaller capacities. Models from one ton up to 180 tons capacity.

4. UNIT COOLERS
Floor type. For direct expansion FREON or brine circulation and also for flooded ammonia. Available as dry units with water defrost or continuous brine spray.

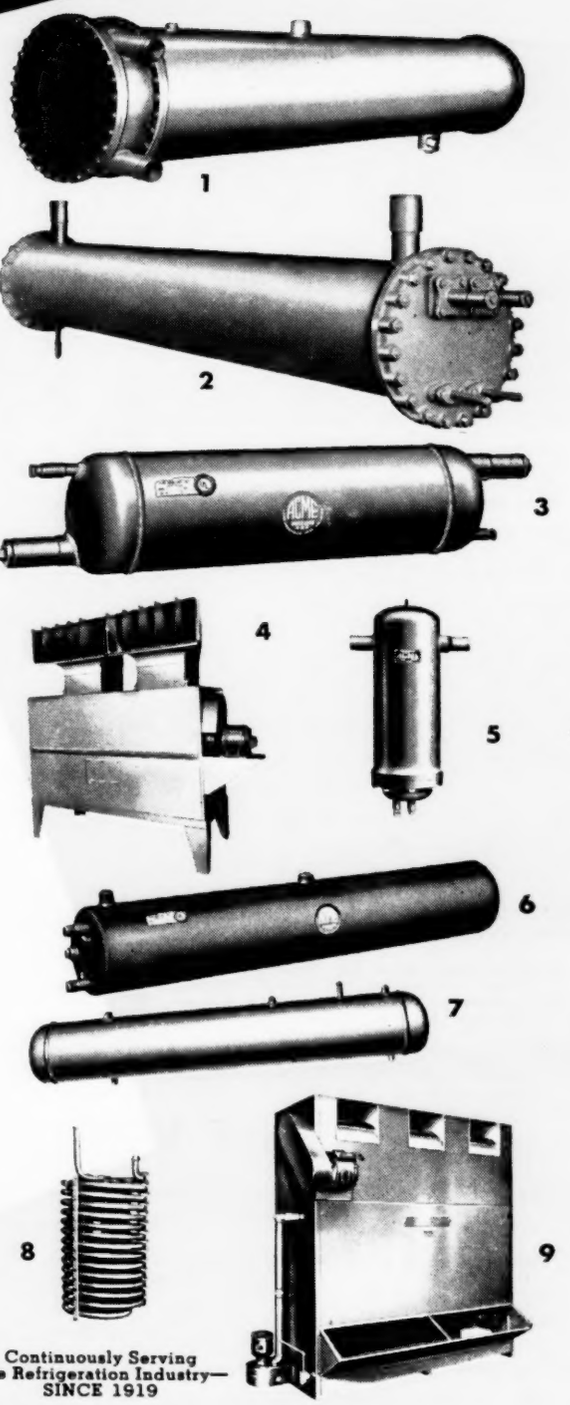
5. OIL SEPARATORS
Low gas velocities for effective separation. An outstanding ACME development in engineering a better oil separator. Experience proves them more efficient. A range of standard sizes for all installations.

6. SHELL AND COIL CONDENSERS
Compact and sturdily built these low-cost models are extremely popular both as original equipment and for replacement where water is fairly free from fouling impurities. Copper condenser coil, shell of steel tubing. Capacities from ½ to 5 h.p.

7. LIQUID RECEIVERS
For FREON, Ammonia and other refrigerants. Provide a liquid seal preventing refrigerant gas from entering liquid line to the evaporator. Also provide storage space for entire refrigerant charge in case of shut-down and also surplus supply of refrigerant.

8. PIPE COILS
All-steel pipe coils in a wide variety of sizes and designs. Carefully tested under 300 lbs. air pressure under water.

9. EVAPORATIVE CONDENSERS
The new 1948 models of Evaporative Condensers have been engineered from over 10 years experience—they're definitely more efficient. Flexible blower arrangement permits vertical discharge or front or rear discharge — this arrangement changeable in the field. Rust-resistant housing. Prime surface coils.



Continuously Serving
The Refrigeration Industry—
SINCE 1919

Acme

INDUSTRIES INC.

JACKSON, MICHIGAN

WRITE FOR CATALOG ON ANY ITEM

Washington News

LORING F. OVERMAN

CURRENT goin's-on in Washington recall a cartoon that appeared some years ago in a national magazine. Pictured were two comic strip cops, speeding along a broad highway.

"I have a strange feeling," said one, "that we're headed in the wrong direction."

"Same here," replied the driver, "but we're making such good time that I hate to turn back."

So it is in Washington, with legislators and administrators somewhat enjoying the thrill of piloting a nation at the supersonic speed made possible by a national income of $230 billion. Tempering the thrill is the conviction that the pace is too fast; that the brakes should be applied. But where? And when? And to what ultimate effect?

It is hardly fair to imply that those at Washington have any exclusive on puzzlement over today's affairs. Washington, after all, represents only the sum total of the elected thinking of 48 States. Difference is that an opinion voiced in Washington makes the headlines everywhere; a mistake made here affects the lives of millions for years to come. Perhaps the best way to appreciate what those in Washington are up against is to introduce, at a friendly gathering of a dozen or so members of the heating and ventilating industries, some current business topic. Human nature will do the rest. It is probable that peace could be restored in such a gathering only by a compromise —with each participant still convinced that his initial solution should have been accepted in its entirety.

Compromise is a common medium of exchange in Washington. Too often, proposals are made with the knowledge that it will be necessary to settle for less than originally asked. Counter proposals are similarly phrased. The result often is that both proposals sound more or less ridiculous, and the resultant solution is a compromise that fails to solve the problem. Hence, the conclusion that those in Washington aren't thinking to clearly.

Human nature is also involved. Senator Ball (Minn.), touched on this at the January meeting in Washington of the Small Businessmen's Association. "I get hundreds of letters urging me to do what I can to cut Government expenditures," observed Senator Ball, "yet some will contain a postcript suggesting that nothing be permitted to interfere with the writer's pet dam project, airport development, or similar activity. Everybody wants Government expenditures cut, but no one wants such a cut to affect him personally."

As the result of this tendency to compromise and to cater to human nature, much that is thoughtful comes out of Washington and is overlooked because it contains windowdressing that makes the headlines and directs thought away from the main theme. Case in point is the January report of the Council of Economic Advisers. Those who take the trouble to read past the phrases thrown in for political purposes, will find food for thought. The report is issued under the name of the President, but it is prepared by economic advisers under legal authority by Congress, to study the economic guidepost, and to announce a finding. Many regard it as a composite job of national economic analysis, contributed to by both business and government, and hence worthwhile because of the course it predicts.

In cautious phrases (nobody likes to put on the brakes too hard when it's such fun to ride fast), the Report suggests a number of steps that should be taken by Congress, Business, and Labor to offset the present accelerating $230 billion speed. Reading between the lines leaves the impression that more could have been said in the way of warning if the advisers had not hesitated to be labeled as kill-joys—particularly in an election year.

Readers who will take time to cull the wheat from the chaff may find it worthwhile to read the entire Report, obtainable for 35c, from the Government Printing Office, Washington 25, D. C. Others may find it significant in the heating and ventilating field to know that the Report stresses the need for tighter credit curbs, legislation to raise bank reserves, limiting of consumer credit, and a policy requiring supporting of Government bonds at par.

Home mortgage loans should be more conservative, the Report urges, and considerable doubt is expressed as to how long construction will continue at present levels, with costs double 1940. Implication is that a moderate slowdown in construction would do no great harm, easing present pressure on prices and making way for certain essential construction now being held back. The Report also observes that construction of housing for rent should be stepped up; housing for sale stepped down, and business construction deferred unless it serves to increase production in the near future.

The Report also incorporates many of the ideas included in the President's State-of-the-Nation report to Congress—including some of the points that made headlines and obscured meatier and less political sections. But that's what makes interesting reading—seeing what was said, and what was added, and then trying to guess which is the blueprint and which is the artist's perspective. Regardless of controversial write-ins, Washington still regards the Report as must reading for businessmen in 1948.

Rental Credits Urged

Perhaps intended to implement the Report's suggestion with reference to rental housing, Tighe Woods, Housing Expediter, made an interesting proposal on January 22 when testifying before the Joint Committee on Housing. Woods proposed a plan to give immediate stimulus to the building of rental property

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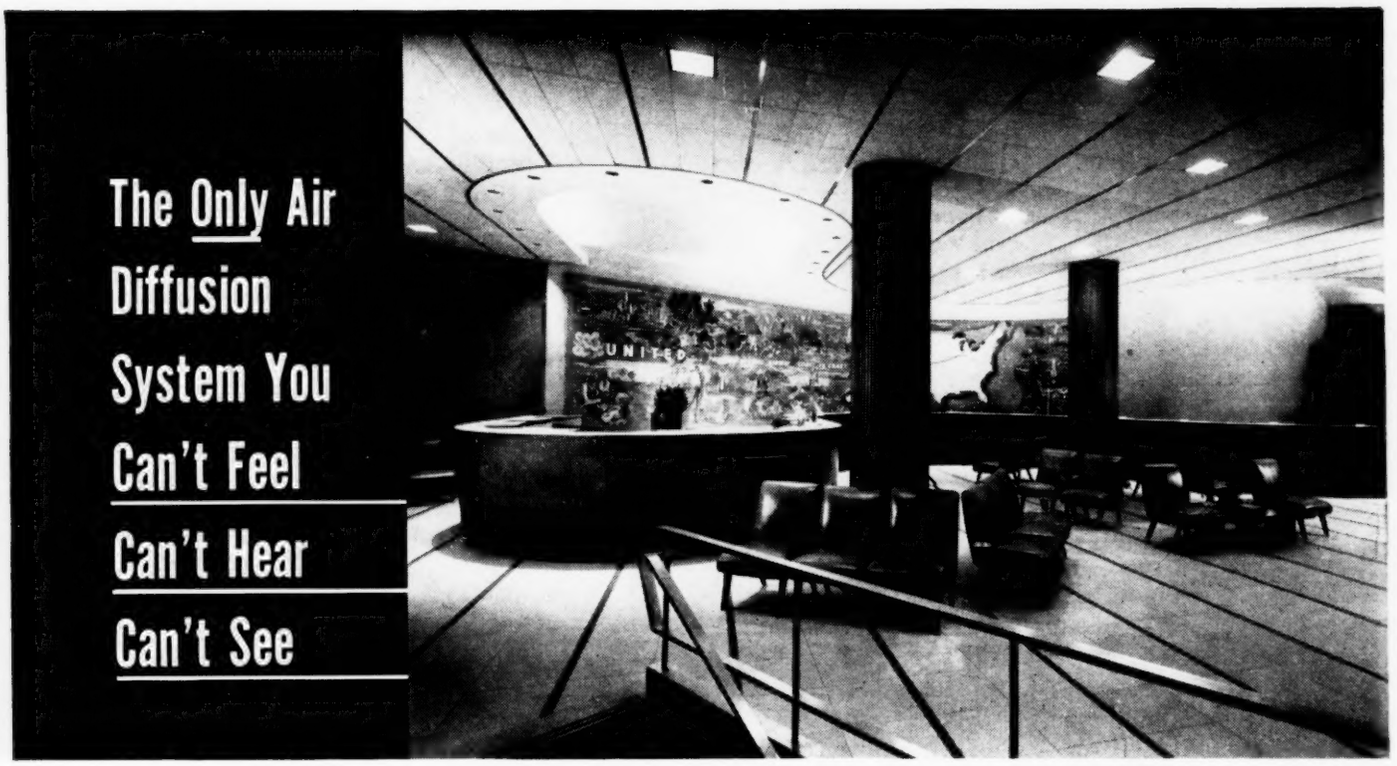

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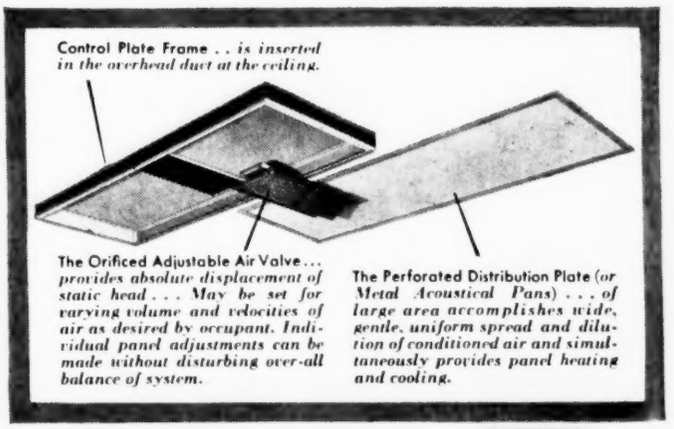
Control Plate Frame . . is inserted in the overhead duct at the ceiling.
The Orificed Adjustable Air Valve... provides absolute displacement of static head . . . May be set for varying volume and velocities of air as desired by occupant. Individual panel adjustments can be made without disturbing over-all balance of system.
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by allowing a special Federal tax reduction over the next five years.

To overcome the reluctance of private capital to invest in rental housing, Woods proposed a system of accelerated depreciation, by which the investor would recover his excess building costs in five years. The Housing Expediter, he said, would recommend to the Treasury Department that the investor is entitled to a certificate of necessity for that portion of his investment which represents "water", or inflated costs.

Property built under these certificates would thus depreciate faster for the purposes of taxation.

Woods said he had worked out with the representative of a large insurance company the details of how the plan would operate on a project of 164 apartments ranging in size from 4½ to 6 rooms at rentals of $20 per room or less per month, with construction cost of buildings and land not to exceed $2,000 per room.

"This insurance company," Woods said, "stated that if this type of financing were made available by the Government, it had several million dollars of building plans in the blueprint stage which would immediately become realities."

Woods warned that experts believe the cost of labor and materials will continue at present levels for the next five years. He added a warning that when the full impact of the Marshall Plan is felt next year, certain shortages, such as soil pipe, will be aggravated. Multiple-family dwellings, he noted, can be erected at considerable saving in critical materials over single-family houses.

National Housing Policy?

Indications in Washington are that, as soon as the European Recovery Program and the Knutson tax reduction legislative projects are out of the way—many weeks hence—Congress may again turn its thoughts to the Taft-Ellender-Wagner bill providing for a national housing policy under coordinated supervision of a National Housing Commission. After extending rent control, of course. The Taft-Ellender-Wagner bill sets up a goal of 12,500,000 housing units in the next 10 years, and includes provisions to implement such a program.

Included are provisions for slum clearance and certain borderline low income housing to be built with the assistance of Federal funds. This bill is typical of the type of subject that starts arguments, in Washington and elsewhere, as to where the functions of Government should stop, and just what they should cover. The proposal has been footballing around Congress since August 1, 1945, and has been tagged with such epithets as "socialistic"; even "communistic". Yet, it is difficult to picture anyone less inclined to these isms than Senator Taft, one of the proponents of the legislation.

Whether the bill will get kicked through the goal posts or out of the park is a mighty big question, but it is interesting to note, again, how human nature gets into the picture. Senator Robert F. Wagner (N.Y.), recently released data from a survey indicating that nine out of 10 state and local leaders believe a Federal housing program is urgently needed because "private enterprise could not now or in the foreseeable future provide decent housing for low-income families." The conclusion was based on a nation-wide survey of slum clearance problems in which all Governors, and the Mayors of every city of over 50,000 was asked to respond, as well as scores of business and civic leaders.

"Almost without exception," said Senator Wagner, "the persons polled recommended a continuation of Federal assistance to local communities for slum clearance and for the construction of low-rent public housing projects. Dissents were few among all groups, including those directly connected with private home building and finance. The replies contained a prevailing note of urgency as to the vital need for prompt action by Congress to meet the housing shortage."

1947 Housing Data

Final figures on new non-farm housing construction during 1947, released by the Bureau of Labor Statistics, totalled $4.9 billion—the dollar value 55% ahead of 1946; the physical volume up only 22%, when costs are adjusted to 1939 levels. The total expended for all construction, including those for minor building repairs was $14.9 billion—higher than any year on record, and 27.7% above 1946. The total for new construction was $12.9 billion—30% above 1946 in dollar value, but only 7% ahead in physical volume.

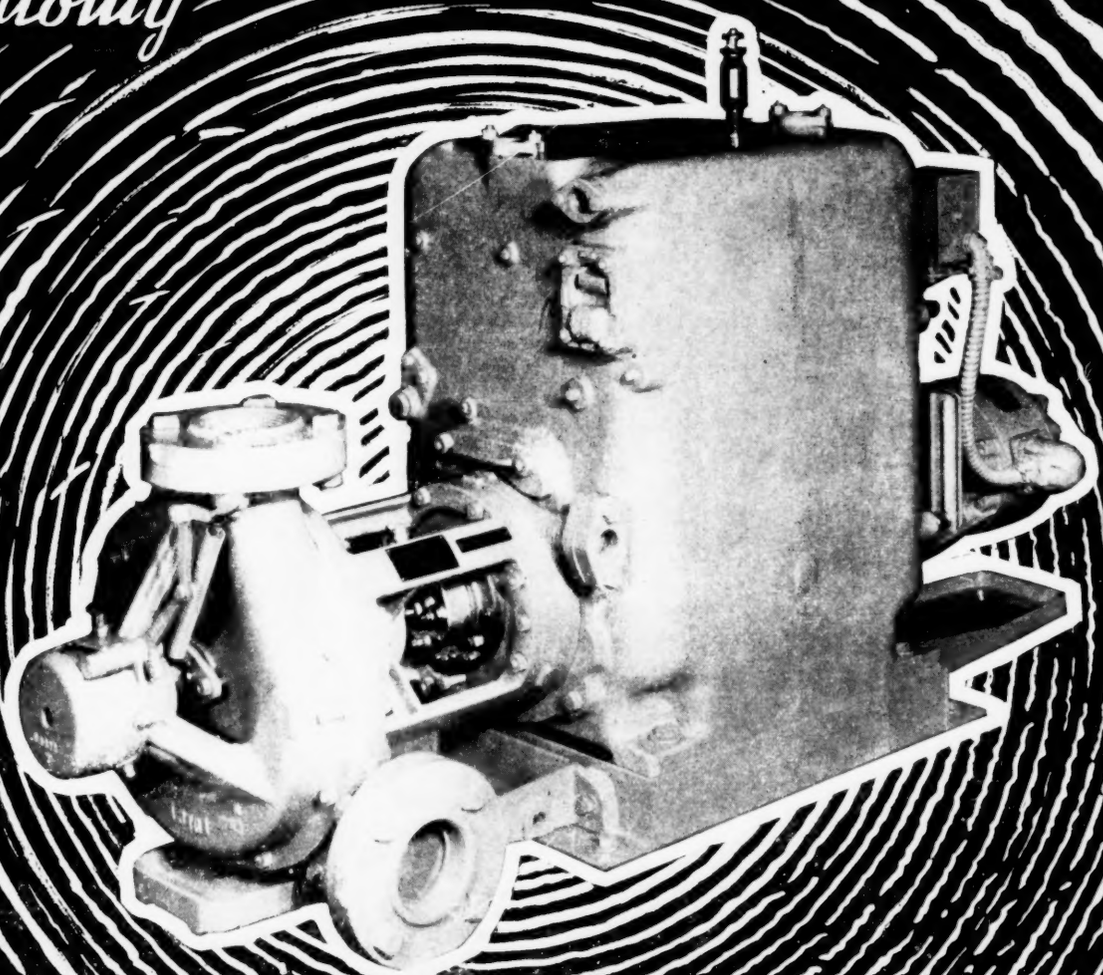
John L. Chuckling?

It is to be wondered if John L. Lewis and his United Mine Workers may not be somewhat sadistically amused by the present plight of the oil industry and its fuel-shorted customers. There can be little doubt that one of the many reasons for "changing to oil" was the Lewis threat to the supply of coal. Now the oil industry finds itself with new uses and new users for 20 billion gallons more oil per year than its previous biggest pre-war year, 1941, and 7 billion gallons more than its biggest war year.

That the current shortage may be repeated next year was suggested to the House Committee investigating the Marshall Plan by Secretary of the Interior Krug. Queried as to the possible effect of the European Recovery Plan on petroleum supplies, Secretary Krug told the committee that oil exports under the plan will be more than offset by imports, but that there is danger that this country will exhaust its oil unless it begins developing synthetic liquid fuels. His doubts concerning next season were expressed when he said that while it is too late to impose rationing or price control on oil this winter, he believes it will have to be done next year.

Oil industry executives question the Secretary's position with regard to reserves, and look to increased production of steel—for drilling and distribution facilities—for a solution to the shortage. As for developing a synthetic industry, this would require 10 years, Secretary Krug estimates, and vast amounts of steel. Experimental work is progressing along this line, however, and it is estimated that oil shale reserves of the United States contain 144 billion barrels of oil, of which 92 billions are said to be recoverable.

Centralized Heating Economy



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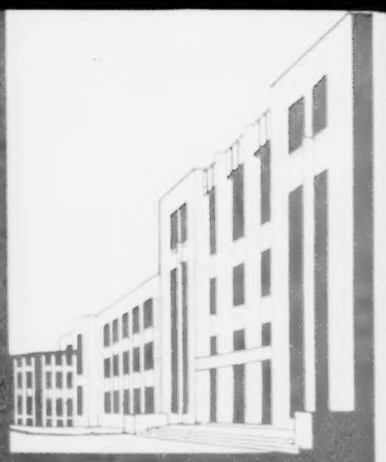
Heating and Ventilating for School Buildings



BUILDING TYPE *Section*

THOMAS F. DWYER

Chief, Heating and Ventilating Division, Board of Education, New York City

How to heat and ventilate the various rooms that are part of the modern school building. The author, who has had thirty years experience in this field, presents valuable data.

THE design of heating and ventilating systems for school buildings offers many problems not ordinarily met in other types of buildings, and it is exceedingly difficult to lay down hard and fast rules that will cover all cases. However, it is the purpose of this article to describe methods that have proven satisfactory in providing suitable heating and ventilating.

Boiler Room

The boiler room should be centrally located and should have natural light and ventilation. As the boiler room is the heart of the heating system, there is no reason why it should not also be a part of the educational system. The walls and column facings may be a light shade of architectural terra cotta and the brick bases of the boiler settings can have a salt glazed finish. Pipes may be painted with aluminum paint, with the function of the pipe stenciled on the pipe in black letters of sufficient size to make them readable from the floor. Steam gages, thermometers, draft gages and CO_2 recorders should be installed to give the operator a visible check on plant operation. Where possible, an observation gallery may be provided to give pupils an opportunity to observe the operation of the plant.

Since the heating load will vary with the weather, the boiler plant should consist of two or more units of the same size to permit flexible operation in meeting varying load conditions, rather than one or two large units.

Boilers

Boilers may be of the cast iron sectional type, or steel fire-tube type. Where cast iron boilers are used, the outside header screw nipple type is to be preferred since it is much easier to replace sections than with the push nipple type. The author prefers to limit units of this type to a maximum of 15,000 sq ft EDR.

The horizontal return tubular locomotive fire box type and the three-pass horizontal return tubular type with the crown sheet concave to the fire surface, are types of steel fire-tube boilers that give excellent results.

These boilers are built in various sizes to meet any condition. In plotting boilers, care should be taken to provide sufficient clearance at the ends of the boiler for tube withdrawal.

Fuels

The variety of fuel to be used will depend a great deal on locality. Where bituminous coal is used, the boiler should be designed for smokeless operation. Where anthracite coal is used, the smaller sizes of pea or buckwheat should be used, and the air space in the grates should be not larger than 5/16 in. The use of the smaller coal sizes will require a forced draft blower, unless chimney heights of over 60 ft are provided.

Hand firing will generally be found satisfactory for the ordinary installation, but where three or more boilers are installed, consideration should be given to the use of mechanical stokers. This decision will be governed by the initial cost of the equipment, the yearly charges of amortization and maintenance and operation, as compared with any savings that might result when using a cheaper grade of fuel plus savings in operating charges.

If oil is used it should be the heavy No. 5 or No. 6 grade. Preheaters are necessary with these grades. For small schools, it is possible to use a pressure atomizing or gun type burner, using No. 2 light fuel oil.

Where oil is used, at least two storage tanks should be installed, of sufficient capacity to provide at least one month's supply.

The coal storage space should be sufficient to accommodate a supply for the entire heating season. This permits buying and storing the coal during the

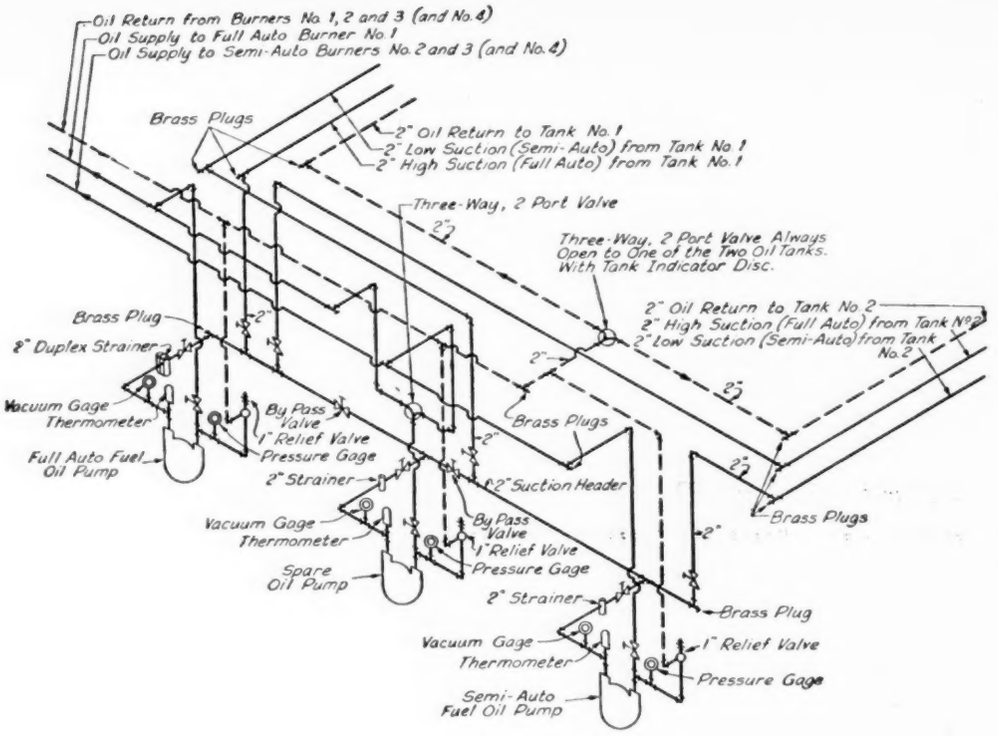

Oil Return from Burners No. 1, 2 and 3 (and No. 4)
Oil Supply to Full Auto Burner No. 1
Oil Supply to Semi-Auto Burners No. 2 and 3 (and No. 4)
Brass Plugs
2" Oil Return to Tank No. 1
2" Low Suction (Semi-Auto) from Tank No. 1
2" High Suction (Full Auto) from Tank No. 1
Three-Way, 2 Port Valve
Three-Way, 2 Port Valve Always Open to One of the Two Oil Tanks. With Tank Indicator Disc.
2" Oil Return to Tank No. 2
2" High Suction (Full Auto) from Tank No. 2
2" Low Suction (Semi-Auto) from Tank No. 2
Brass Plug
8" Duplex Strainer
Vacuum Gage
Thermometer
By Pass Valve
1" Relief Valve
Pressure Gage
Full Auto Fuel Oil Pump
2" Strainer
2" Suction Header
Brass Plugs
Vacuum Gage
Thermometer
By Pass Valve
1" Relief Valve
Pressure Gage
Spare Oil Pump
2" Strainer
Brass Plug
Vacuum Gage
Thermometer
1" Relief Valve
Pressure Gage
Semi-Auto Fuel Oil Pump

Fig. 1. Typical piping layout for fully automatic and semi-automatic type burners.

summer season when prices are low and supplies plentiful.

Oil Burners

Where the burners are operated automatically by electric controls they may be of the fully automatic horizontal rotary cup type. Where the starting and stopping of the burners as well as the ignition of the oil is performed manually, the semi-automatic type may be used.

The oil pump may be an integral part of the burner, driven by the same motor that operates the burner, or a separate motor-driven unit located remote from the burner. Where burners are located at some distance from the oil storage tanks, necessitating long suction lines, the separate pump unit is preferable. A typical piping layout, showing connections to a plant using both fully automatic and semi-automatic type burners is shown in Fig. 1.

This layout permits the pump labelled "spare unit," to be used for either of the burners.

Heating System

The heating system should be a low pressure steam system with vacuum return. On small buildings satisfactory results can be obtained with a two-pipe vapor system having return traps on the radiators, a large air vent on the return main, and an alternating receiver at the boiler for returning the condensate to the boiler.

As the demands of the heating system are of an intermittent nature, the design should provide for heating all parts of the building quickly and evenly. Provision should be made for shutting off the heat supply to portions of the building not used during or after school hours. This can be accomplished by dividing the building into zones, with steam mains arranged to supply the various zones, and control valves installed for each main to permit shutting off sections of the building that might not be in use.

This is especially desirable where parts of the building may be used for community purposes after school hours.

Classrooms

Classrooms require a combination of heating and ventilating. Heating is by means of direct radiators or convectors designed to maintain room temperatures of 68 to 70F. Where direct radiators are used, they should be equipped with shields to protect the pupils sitting close to the radiators. Some form of ventilation is necessary and one standard calls for 10 cfm of outdoor air per occupant as the minimum necessary for the removal of body odors. Most states have adopted specific codes regarding ventilation requirements for school buildings.

There are three methods of providing this ventilation.

(1) Open window, with gravity or mechanical exhaust.
(2) Ventilating units with mechanical exhaust.
(3) Mechanical fan systems with a fan for the supply system and a separate fan for the exhaust system.

In the open window type of ventilation, radiators of sufficient capacity to provide for the customary heat losses and also to warm the incoming air required for ventilation, are installed under each window. A manually operated shut-off valve should be installed in the steam supply to each radiator. Deflectors, set at an angle, are installed at the window sill and the air is admitted by opening the window at the bottom.

Attempts have been made to have the outdoor air circulate through the radiator by having louvered openings in the wall, under the window or by providing baffles to deflect the incoming air in back of the

radiator. This is a reversion to the old direct indirect radiator idea which was never very successful and has become obsolete. The present type of radiator is not designed or adapted to heat incoming air of temperatures below 30F, and any attempt to heat the outdoor air during the winter season by circulating same through the radiator will result in failure and an inevitable repair bill.

An exhaust opening connected to the exhaust duct in the hung ceiling of the corridor, is provided in the corridor side of the room opposite the windows. The exhaust outlet should be near the floor. Two outlets located at opposite ends of the room will provide a more even circulation of air throughout the room than one large outlet. The exhaust duct is connected to a ventilator above the roof for gravity exhaust, or to a fan discharging through a ventilator where mechanical exhaust is required. Gravity exhaust is very unsatisfactory and the mechanical exhaust system is preferred. A roof type exhauster which combines an exhaust fan, motor and ventilator all in one unit, is not an expensive item. The mechanical system permits the use of smaller ducts and flues than the gravity system, and the resulting savings will offset the cost of the exhaust fan.

This type ventilation is cheap to install but is subject to the vagaries of nature and the whims of the teacher. It inevitably results in no ventilation.

Unit Ventilation

In a ventilating unit system, a unit is placed at the window, preferably near the center of the room. The unit consists of a heating coil, two or more motor-driven fans, the necessary intake and by-pass dampers to permit outdoor air to be drawn through an opening in the outside wall, with a grille on the face of the room side of the unit near the floor. This permits mixing room air with outside air, if desired, or full recirculation of the room air during the warming up period. The air is discharged vertically over the window through a grille in the top of the unit. Supplemental direct radiation is installed when the unit output is sufficient to compensate for heat losses. An exhaust opening, at the floor, located opposite the windows on the corridor side of the room should be provided. This opening should connect to the exhaust duct located in the hung ceiling of the corridor, which terminates in a motor-driven exhaust fan discharging through a ventilator on the roof. The exhaust from the classroom may also be taken through the wardrobe as described later.

The ventilating unit simplifies the design of the ventilating system. It eliminates the use of duct work for the supply air and permits each classroom to be an independent unit. Air quantity and temperature may be varied to meet changing conditions. The damper arrangement in the unit allows full recirculation of room air, and this is desirable for quick warming of the room in the morning.

Some disadvantages of the ventilating unit are that the architect generally objects to the location of the fresh air intake opening in the outside wall for aesthetic reasons, and unless the wall box and connection to the unit are carefully installed, water may penetrate the opening during heavy rains. On windy days, the outdoor air often blows directly through the fresh air inlet and out the recirculation grille which is at the bottom of the room side of the unit. This causes cold drafts along the floor.

The air is discharged from the outlet grille at a high velocity and the inability to properly control the distribution of this air often results in a too rapid air movement in parts of the room.

Floor Systems

In the mechanical fan system, air for ventilation is furnished by a supply fan and heating coil installed on each floor. In large buildings it may be necessary to install two or more of these units to properly zone the building. The use of small units for each floor is more flexible in operation and permits better control than one large unit, to supply the entire building.

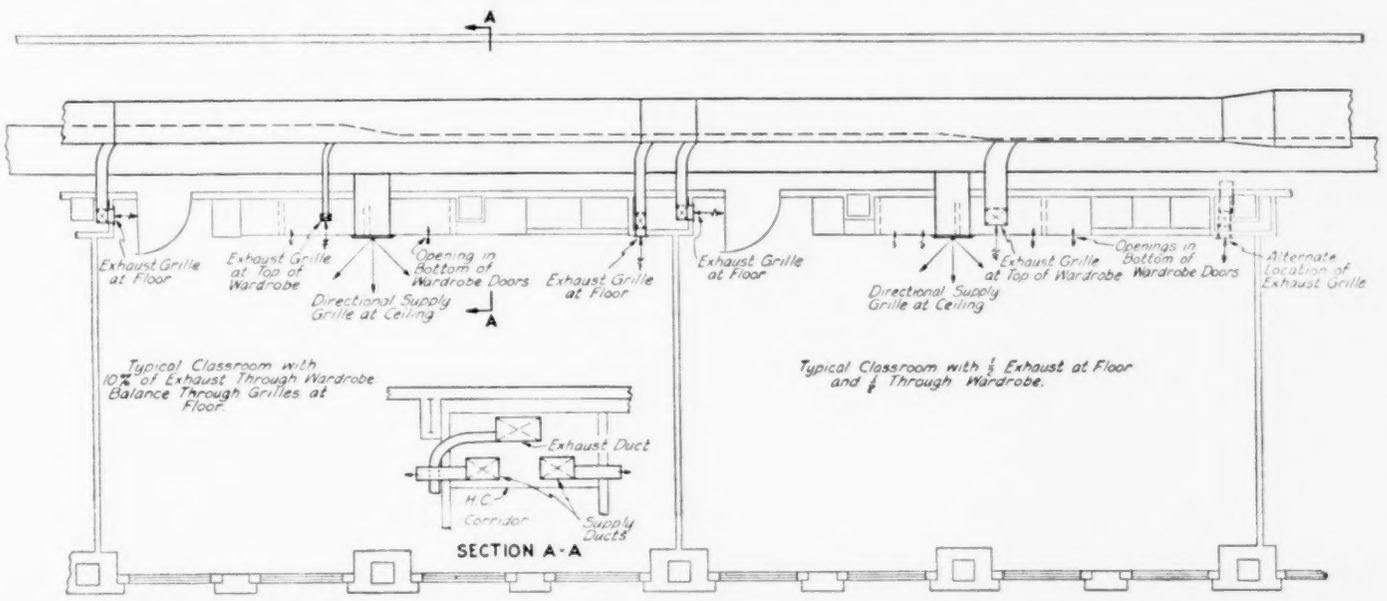
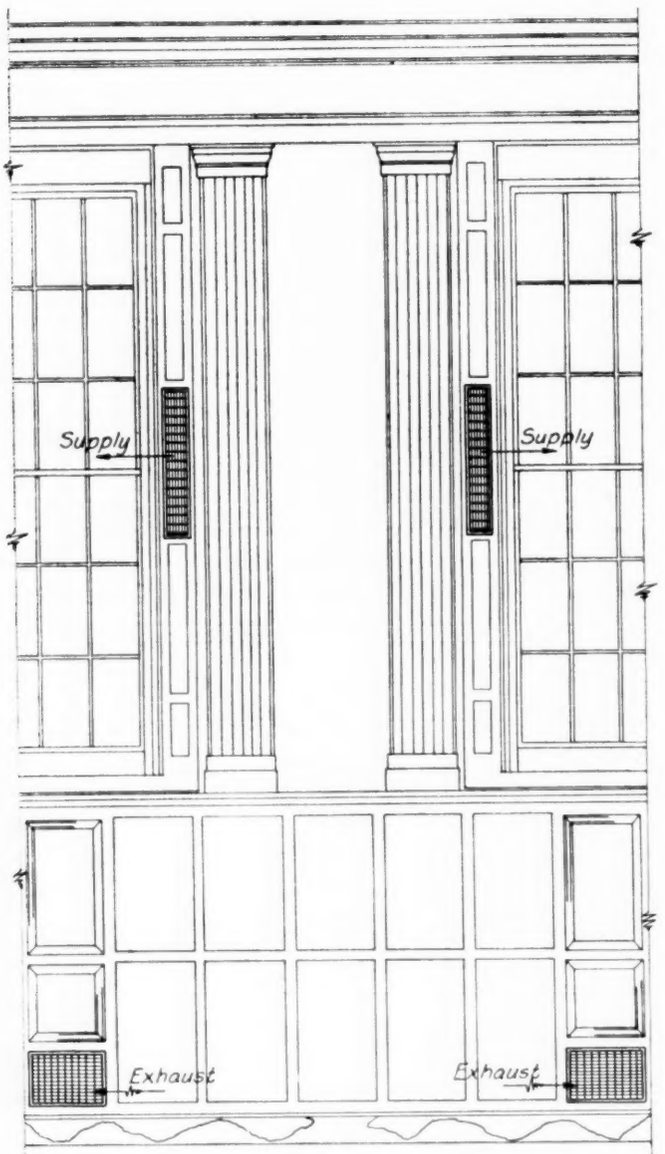

A
Exhaust Grille at Floor
Exhaust Grille at Top of Wardrobe
Opening in Bottom of Wardrobe Doors
Directional Supply Grille at Ceiling
Exhaust Grille at Floor
A
Typical Classroom with 10% of Exhaust Through Wardrobe Balance Through Grilles at Floor
Exhaust Duct
H.C.
Corridor
Supply Ducts
SECTION A-A
Exhaust Grille at Floor
Directional Supply Grille at Ceiling
Exhaust Grille at Top of Wardrobe
Openings in Bottom of Wardrobe Doors
Alternate Location of Exhaust Grille
Typical Classroom with ½ Exhaust at Floor and ½ Through Wardrobe.

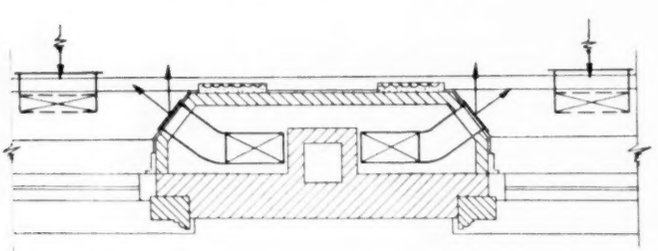
Fig. 2. Air distribution for two typical types of classrooms.

The supply air is distributed in ducts located in the hung ceiling space of the corridors with outlets to the individual rooms located on the corridor side of the room, blowing directly toward the windows. Directional grilles placed in the outlets permit the proper distribution of the air throughout the room. An exhaust outlet is located on the corridor side of the room with the opening close to the floor. Where wardrobes are provided, the air may be exhausted through the wardrobes. Openings should be provided close to the floor in the doors of the wardrobes, and the air exhausted at the wardrobe ceiling. This permits air circulation through the wardrobe which is especially desirable on rainy days due to damp clothing.

Corridor exhaust, where openings are provided in the corridor wall of the classroom, allowing the air supplied for ventilation to escape into the corridor from whence it passes up the stairways or to a roof ventilator, should not be used as this type of system is condemned by the National Board of Fire Underwriters.



HALF ELEVATION OF WINDOW PIER



PLAN OF WINDOW PIER

Fig. 3. Method of discharging air across windows of auditoriums through grilles.

Convector Radiators

Air supplied for ventilation is delivered to the room at a temperature of 70 to 75F. Heating is provided by the installation of convectors at the windows.

The convector radiator may be recessed in the wall with a flush type panel face containing the inlet opening at the floor and with outlet grille in the face of the panel or in the window sill. A sheet metal liner should be provided to enclose the radiator and this liner should have a layer of insulating board attached to the surfaces in contact with the outside wall. In lieu of the recessed type, the convector enclosure may be a free standing cabinet type, or the enclosure may extend the full width of the window, to fill the entire wall space between the column pilasters. Where the length permits, the end portions of the enclosure can be arranged to form shelves for desirable storage space.

The convector enclosure should have removable access panels designed to expose the valves and traps.

Auditorium

The auditorium is generally utilized by large groups of persons closely assembled, which makes mechanical ventilation a necessity. The ventilation system can also be used to provide the heating by raising the temperature of the air delivered to the room sufficiently high enough to compensate for the heat losses from the room. This practice eliminates the need for radiators. As windows invariably present large areas of glass surface, they should be thoroughly blanketed with a curtain of warm air to prevent cold down drafts. This can be accomplished by delivering the supply air in a vertical direction over the window through grilles located in the window sills. Another method is to discharge the air across the face of the windows through grilles located about 10 ft above the floor, as shown in Fig. 3.

Air is exhausted from the auditorium through mushroom diffusers set in the floor under the seats or through outlets incorporated with the leg of the seat as shown in Fig. 4. These outlets should be properly spaced to provide even diffusion of the air throughout the room and may be supplemented with exhaust grilles near the floor, in the side and end walls of the room.

Where the auditorium may be used in warm weather, or where it is located in the interior of the building, consideration should be given to some form of cooling. In this case, the air should be supplied at or near the ceiling and exhausted at the floor.

Cafeterias and Lunch Rooms

The air supply for these rooms should be based on a 10-minute air change with a room temperature of 70. Heating may be provided by convectors recessed in the wall, or the air supplied for ventilation may be utilized for heating. The air supply may be located in the piers at the outside walls to discharge across the windows and into the room as shown in Fig. 5, or the supply grilles may be arranged to discharge the air across the room near the ceiling from a duct located in a hung ceiling in the center of the room as shown in Fig. 7. Exhaust outlets should be near the floor. The volume of air to be exhausted should be 90% of the supply and the greater part of this air should be exhausted through the serving spaces and kitchen which invariably are adjacent to the cafeteria.

Kitchens

As the kitchen is an integral part of the cafeteria, the air required for ventilation should be supplied from the same system. Air supply to the kitchen should be based on a 5-minute air change with the exhaust calculated on the basis of a 3-minute air change. This excess volume is drawn from the cafeteria. Such an arrangement provides a positive flow of air from the cafeteria to the kitchen to eliminate kitchen odors from entering the cafeteria.

Air supply to the kitchen should be close to the floor and the exhaust should be through hoods placed over the cooking ranges, stock pots, baking oven, or other cooking apparatus. Vent outlets should also be provided over the steam tables and coffee urns.

Outlets in the hoods should be equipped with flameproof wire mesh air filters to prevent grease entering the vent flue. These filters should be installed in a manner that will permit them to be removed easily for cleaning.

The kitchen exhaust system should be independent of the cafeteria and a separate exhaust fan should be provided for this purpose. This fan discharge should connect to an independent flue terminating above the roof. The flue should be a masonry flue as a protection against grease fires.

In domestic science rooms where a number of model unit kitchens are provided, an exhaust outlet should be located in the ceiling of these compartments directly over the cooking range. This outlet may be connected into the general exhaust system, since these units do not present the same hazards as the large kitchens.

Gymnasiums and Playrooms

Heating of playrooms must be arranged so that it does not interfere with the normal activities or present a hazard. Heating therefore should be by means of recessed or flush type convectors, or the heating may be combined with the air supplied for ventilation.

The volume of air required should be based on a 15-minute air change with a room temperature of 65F. The system should, however, be capable of maintaining 70F when required. The method of supplying the air should be across the window and into the room as shown in Fig. 5.

The exhaust grilles should be located at the sides and ends of the rooms at the floor.

Locker Rooms

Heating should be designed for a room temperature of 80F and air supplied for ventilation should be computed to provide a 6- to 10-minute air change. The system may be the split type with heating by convectors and with tempered air supplied for ventilation. The air supply should be uniform throughout the room with the supply grilles at the windows or near the ceiling similar to the method described for cafeterias. Exhaust should be taken through the lockers, through louvered openings in the locker doors. The backs or tops of the lockers should be perforated or have wire mesh panels. These openings can be connected to a vent duct or furred-out space in the rear of the lockers and connected to the main exhaust duct leading to the exhaust fan.

This arrangement permits a positive circulation of air through the lockers, which is essential where gym suits or clothing may be stored.

Chemical Laboratories

Chemical laboratories, and other rooms where toxic gases may be developed, require a positive mechanical exhaust system to prevent odors from these rooms passing through the building.

The air supply should be designed to give an air change every 5 minutes with an exhaust system connected to an independent exhaust fan designed to give an air change every 3 minutes. Special vent hoods should be installed on the demonstration table, and where fume hoods are provided they should have outlets at both the top and bottom of the hood.

Duct work used in the exhaust system should be lead clad copper, or the duct work and the exhaust fan should be sprayed with acid resisting paint. The wheel and housing of the exhaust fan should be treated with a similar paint spray.

Shops

Shops are generally heated to 60F, but since in schools part of the shop period invariably includes an instruction talk or lecture by the instructor, it is therefore necessary to design the heating to maintain a room temperature of 70F. Wall hung legless column radiators or wall type radiators will be satisfactory.

Where work benches are provided along the outside wall of the room, they must be arranged so that they do not cover up the radiators that may be placed directly under the windows. The bench may be cut out to fit around the radiator, or a flush type grille may be placed in the top of the bench directly over the radiator. Where there is sufficient space between the top of the bench and the window sill, fin type radiation may be installed on the wall below the sill. This should be provided with a protective metal cover with open grille which is standard equipment for this type radiator.

Unit Heaters, described later, may also be used.

Shops that have woodworking or grinding machines creating dust that may be injurious to health should

have special exhaust systems connecting directly to the machines. Furnaces or other heat-producing units should be provided with hoods connected to an independent exhaust system.

Swimming Pools

Heating should be designed to maintain a minimum temperature of 80F. It should be of the concealed type either by convectors recessed in the wall with flush fronts, or by means of a hot blast system combining both heating and ventilating.

Where the hot blast system is used, the supply grilles should be near the floor designed to provide a supply of warm air at a slow velocity. Window areas should be thoroughly blanketed with a curtain of warm air to eliminate any possibility of cold down drafts. This can be accomplished by discharging the warm air in a vertical direction through a grille located at the window sill similar to the method described under auditoriums. Another method is to supply air in a horizontal direction across the window at the floor level and the window sill level through grilles located in the face of a furred-out flue space located next to the column or pier adjacent to the window.

Exhaust grilles should be located in the ceiling over the pool area, and some should be placed in the side walls of the room near the ceiling.

Where accommodations are provided for spectators, a temperature of 70F is desirable for the spectator area. It is, therefore, necessary to screen this portion of the room from the warmer pool section. A plate glass partition between the two sections will thoroughly isolate the spectators without impairing their view of the pool.

Toilet Rooms

An independent exhaust system designed to give a 5-minute air change in all pupils' toilets should be provided, connected to an exhaust fan discharging to a ventilator above the roof.

Louvered openings in the bottom panels of the toilet room doors will provide positive air circulation from the corridors or adjoining rooms.

In small toilets containing less than three fixtures, a vent outlet in the ceiling will suffice. In large toilets the vent outlets should be near the floor. A furred-out pipe space at the rear of the toilet stalls and urinals can serve the double purpose of providing access to plumbing pipes for repairs, and also as an exhaust chamber for ventilation. A 6 in. x 10 in. bar type grille should be placed in the rear wall of each toilet stall about one foot above the floor, opening directly to the pipe space. Urinals should be of the ventilating type connecting to this space.

One or more duct connections are made to these pipe vent spaces, and these connections are in turn connected to the main exhaust duct leading to the exhaust fan. This may be a roof type exhauster which has the exhaust fan, motor and ventilator combined in one unit located on the roof. The motor starter for the fan is placed in a convenient location in the building.

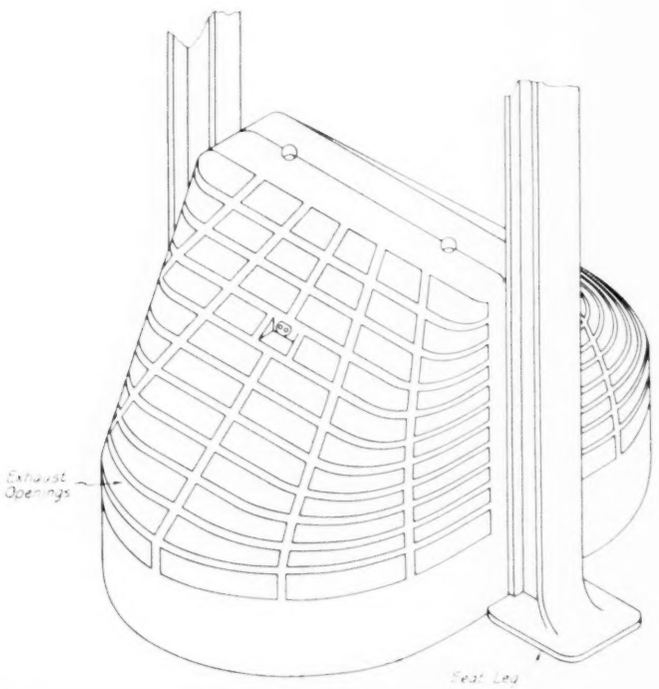


Fig. 4. Mushroom diffusers set on floor under seats.

Unit Heaters

Unit heaters are not generally adaptable to school heating. Ceiling heights are invariably too low for the proper setting of such units and the operating characteristics are not conducive to quiet operation. An unprotected unit heater is also subject to vandalism.

There are some places in the school building where the unit heater can be used to advantage. Shops where the available wall space under windows is taken up with work benches may be readily heated with units set at the end of the rooms blowing directly across the window areas.

Unit heaters may be suitable for entrance lobbies and vestibules. An effective installation method is shown in Fig. 6 where the unit is concealed in an adjoining closet or furred-out space with a recirculation duct connection arranged to connect the heated space with the intake side of the unit. Inlet and outlet grilles are provided as shown to harmonize with the architectural treatment.

Temperature Regulation

In these days of fuel conservation some form of temperature regulation is a necessity. The size and scope of the building will govern the type of system to install. An individual thermostat placed in each room to control the temperature in that room is the acme of perfection, but the cost of this type of installation plus the operating and maintenance charges are considerably more than other systems which give satisfactory results.

Simple and effective control may be obtained by dividing the building into zones. Each zone is supplied by an independent steam main in which is installed a motorized control valve. This valve is controlled by an outdoor thermostat which varies the opening of the valve according to the outdoor tempera-

tures. A control panel placed in the boiler room permits the operator to manually control these valves to increase or decrease the flow of steam through each circuit should the occasion arise.

Hot Water Supply

Where coal is used as a fuel, it is desirable to have a separate coal fired hot water heater directly connected to a storage tank. The hot water may also be heated by means of a steam coil installed in the hot water storage tank.

A small boiler should be installed to supply steam to the coil for periods that the heating system is not in operation. The larger heating boilers cannot be operated efficiently and economically for hot water service only, when hand fired with coal. This small boiler is connected to the steam supply of the coil, together with a line from the steam header of the heating system. A gate valve placed in each of these lines will permit the steam to be supplied from the heating boilers during the heating season and from the small boiler during other periods.

A submerged coil in the boiler or one in the steam space is not recommended.

Pressure Control

Where oil burners are used, it is not necessary to install an independent hot water heating boiler, since the boiler heat losses are not sufficient to warrant the expense of the installation of a separate oil fired unit.

The pressuretrol of the fully automatic oil burner can be set to cut the burner in operation when the steam pressure falls to 1 lb and to automatically shut the burner off when the pressure reaches 5 lb. This will assure steam on the heating coil at all times.

A steam regulating valve is placed in the steam supply to the coil close to the tank, and this valve is controlled by a bulb placed in the storage tank actuated by the temperature of the water in the tank. Thus when the temperature of the water in the tank reaches the maximum for which the bulb is set, the steam regulating valve closes. This causes the pressure in the steam line to rise until this pressure reaches the point for which the pressuretrol is set and the burner shuts off.

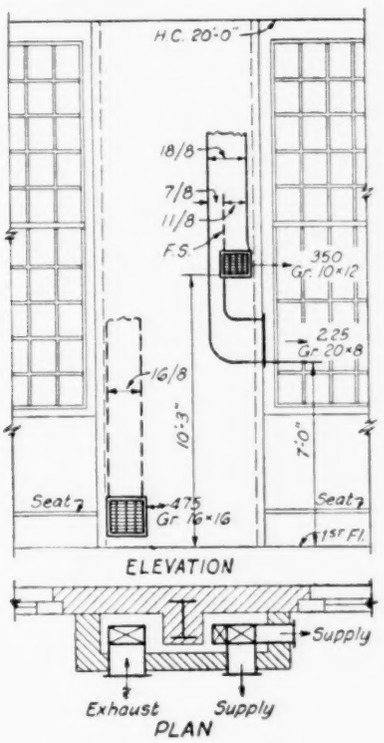


Fig. 5, left. Air supply to discharge across window and into the room.

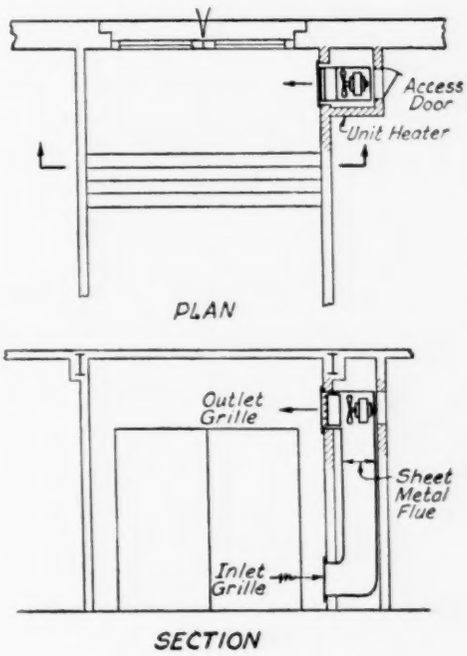


Fig. 6, right. Unit heater installation for entrance lobbies and vestibules.

Filters

Filters are not considered necessary in ventilating systems for schools located in surburban areas. In cities or built up areas where the air may be polluted with dust or the products of combustion, filters are desirable. Filters are generally made in units that are easily handled and they may be of the low cost throw-away-type which are discarded when they have absorbed their capacity, or the permanent viscous impingement rechargeable type. In the permanent type, the filter element is made of smooth round galvanized steel wires arranged in a graduated progressive density mesh, with course mesh acting as the primary filter to remove large material, with the mesh uniformly decreasing in size to a small mesh for the removal of fine matter. These units are generally coated with a viscous solution, are easy to maintain, and give satisfactory performance. A manometer should be placed on inlet and outlet side of each filter bank to indicate the pressure drop through the filter. This also shows when the filters require replacing or cleaning.

Where the permanent type filter is used, provision must be made for cleaning and recharging the filter units. This should consist of a large slop sink with hot water supply and nearby steam connection. A tank to contain the charging fluid and a rack for hold-

ing the filter units while drying should also be provided.

A more expensive type of filter is the automatic viscous type where the filter media is a constantly moving viscous coated fine wire screen.

room where floor coils might be used. The areas adjoining the swimming pool also offer another location where floor coils would fit in very well.

Where acoustically treated ceilings are used, pipe coils in the ceiling should not be used.

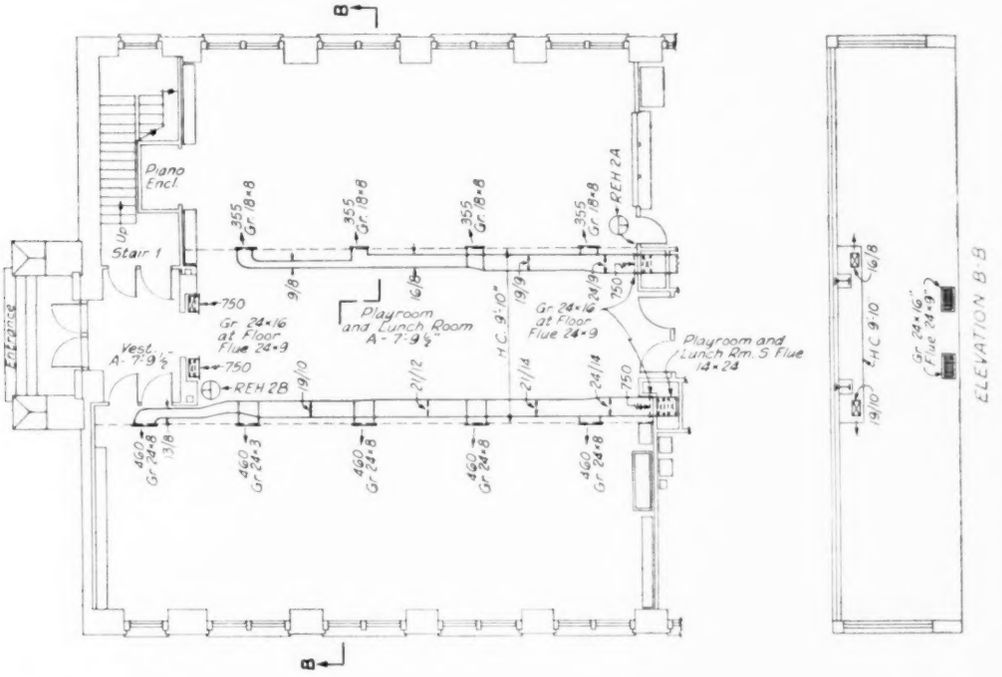


Fig. 7. Supply grilles arranged to discharge air across the room near the ceiling from a duct located in a hung ceiling in the center of the room.

Another type is the electrostatic precipitator type where the air passes through a high tension electric field which causes the dust particles to adhere to electrically charged plates. These units are bulky and expensive to install.

New Developments

There are some new developments that must be given consideration in future planning. The author believes the convector has doomed the use of the free-standing cast-iron radiator as a means of heating in school buildings. The dangers of the safety of the pupils presented by the direct cast-iron radiator have been eliminated by the enclosed convectors.

We may expect to see the use of special fin type radiation with a protective enclosure which was developed for industrial use during the war.

There will probably be a demand for radiant or panel heating, where heating is accomplished by means of hot water circulated through pipes imbedded in the floor slab or ceiling. There are parts of the school building where this type of heating would be desirable, but the author does not consider it a panacea for all school heating problems. Kindergartens, where little children play on the floor, is a type of

Air sterilization is rapidly being recognized as a means of reducing the incidence of child diseases, which are the cause of considerable absenteeism in schools. A recent report published by the City of New York, Department of Health, showed a very high bacteria count in air samples taken in classrooms in schools which did not have mechanical ventilating systems. They exceeded the totals for samples taken in crowded subway cars. A very low count was obtained in air conditioned theaters, where the ventilating apparatus was operated during the periods that the audience was present.

This would seem to indicate that a more beneficial health environment can be provided by a mechanical ventilating system.

Recent tests have indicated that the use of ultra-violet rays or triethylene glycol in the air stream of a ventilating system has a germicidal effect and tends to immunize the occupants from the common cold and other respiratory diseases. The results, however, are not conclusive and the use of these methods of air sterilization have not met with the approval of Public Health authorities. This indicates that further research is necessary before such equipment can be given serious consideration for schools.

Practical Suggestions Covering the Design and Installation of

Industrial Exhaust Systems

E. J. WEISS

Practical suggestions that will help to lower the annual and maintenance cost of an exhaust system. Points covered include underground ductwork, shape of ducts, use of dampers, and discharge stacks.

SINCE cost is a most important consideration in decisions involving the adoption of plans for an exhaust system, it is most essential that the design engineer prepare accurate itemized cost estimates. These figures should be checked against the invited bids from a number of reliable contractors and vendors. Any discrepencies are soon apparent.

For example, on bids requested for a portion of an exhaust system, the figures varied from $1,700 to $4,300. Without hesitation the low bid was accepted as the author's own estimate was $1,580. However, it should be emphasized that accurate detailed drawings and good specifications must be employed to protect the owner and to obtain comparable bids.

If specifications permit the utilization of different equipment or designs, costs must be investigated on an annual cost basis rather than from a first cost standpoint.

Cost Analysis

Let us assume that we are purchasing a grinder exhaust system and that our specifications permits the bidder to use different fans and dust collecting equipment. In addition, let us assume that our specifications are rigid as to quality of work, hoods, duct sizes, effectiveness, etc. Furthermore, let us assume that two bids have been submitted, one called System A, and the other System B. Other factors are given in Table 1.

To obtain our annual cost calculations in Table 2 are made.

Thus we see that while System A is higher in first cost it is far more economical to use than System B when comparing annual costs. The engineer will have to use either his own good judgement as to the life of the equipment, the salvage value at the end of its estimated life, and the anticipated yearly maintenance, or else depend on the manufacturer to supply this data.

While every part of an air moving system can be studied for its economics as to size and details, this procedure would entail prohibitive engineering costs. This would nullify whatever gains were obtained from the study. Therefore, the engineer must rely upon his experience when considering the system components and apply engineering economics to the system as a whole or to the parts when a large system is involved. Annual costs can be used to determine duct sizes when proper considerations are given to power, first costs, and engineering limitations.

Use of Motor Amperage

An economical and fairly accurate method of checking the operation of an existing exhaust system is by the measurement of the fan motor amperage and the speed of the fan itself. The fan speed of a V-belted unit is easily obtained by the use of a tachometer. Amperage, in the case of an alternating current motor, is quickly obtained by using a hook-on volt ammeter which is an instrument that measures the magnetic flux surrounding a covered cable. Ampere measurements are usually made at the switch boxes on each phase of an alternating current motor and the average of the ampere readings used except as noted. In the case of direct current motors, amperage is measured by connecting a standard d-c ammeter into the line.

After measuring the amperes, rapid approximate horsepower calculations can be made by making use of the following electrical formulae and approximations.

Direct Current Motors

$$Hp = \frac{\text{volts} \times \text{amperes} \times \text{eff.}}{746} =$$

$$\left(\frac{\text{measured amp.}}{\text{name plate amp.}} \right) \times \text{name plate hp.}$$

Table 1—Details of Comparative Systems

	System A	System B
First cost	$3,000	$2,500
Life	15 years	10 years
Salvage or scrap values at end of life	$500	$400
Insurance and taxes	2% of first cost	2% of first cost
Power	3 hp	5 hp
Yearly maintenance	$50	$75
Depreciation reserve		
Interest	2%	2%
Cost of money use or interest	4%	4%
Hours used per year	5,000	5,000

Table 2 – Calculations for Annual Charges

	System A		System B	
Interest	$.04 \times 3{,}000 =$	$120.00	$.04 \times 2{,}500 =$	$100.00
Depreciation (Sinking fund method)	$\left[\frac{.02}{(1+.02)^{15}-1}\right]\left[3{,}000-500\right] =$	144.60	$\left[\frac{0.2}{(1+.02)^{10}-1}\right]\left[2{,}500-400\right] =$	191.80
Maintenance		50.00		75.00
Insurance and taxes	$.02 \times 3{,}000 \times 1.04 =$	62.40	$.02 \times 2{,}500 \times 1.04 =$	52.00
Power @ $.015 per. kw hr	$3 \times .746 \times 5{,}000 \times .015 =$	167.85	$5 \times .746 \times 5{,}000 \times .015 =$	279.75
Annual cost		$544.85		$698.55

Single Phase Alternating Current Motors

$$Hp = \frac{\text{volts} \times \text{amperes} \times \text{eff.} \times \text{power factor}}{746} = \left(\frac{\text{measured amp.}}{\text{name plate amp.}}\right) \times \text{name plate hp.}$$

Two-Phase Four-Wire Alternating Current Motors

$$Hp = \frac{\text{volts} \times \text{amp.} \times \text{eff.} \times \text{power factor}}{746} \times 2 = \left(\frac{\text{measured amp.}}{\text{name plate amp.}}\right) \times \text{name plate hp.}$$

Two-Phase Three-Wire Alternating Current Motors

Same as previous except that the current in the common conductor is 1.41 times that in each of the other two conductors.

Three-Phase Alternating Current Motors

$$Hp = \frac{\text{volts} \times \text{amp.} \times 1.73 \times \text{eff.} \times \text{p.f.}}{746} = \left(\frac{\text{measured amp.}}{\text{name plate amp.}}\right) \times \text{name plate hp.}$$

The approximate air quantity and static pressure of the system can then be determined from the fan manufacturer's tables as the approximate horsepower and the fan speed are known.

Amperage is also very useful when it is desired to increase the capacity of an existing system as the following relationship exists where centrifugal fans are being used:

$$\frac{\text{Present fan rpm}}{\text{New fan rpm}} = \frac{\text{measured amp.}}{\text{name plate amp.}} = \frac{\text{present cfm}}{\text{new cfm}}$$

It should be pointed out at this time that the designer should attempt to use motor sizes that almost fully load the motor as unloaded motors lower the power factor of an electrical circuit. In some cases the power companies provide more favorable rates if the power factor is held at or above a certain percentage.

Underground Ductwork

Quite often, it is necessary to locate ductwork underground because of duct interference with overhead material handling equipment, inability in the case of high ceiling buildings to utilize pipe stands because of equipment layout, or because of unsightly appearance of long duct runs. Whatever the reason may be, underground ductwork should be avoided where possible. It is not only very expensive but it is also inflexible with low salvage value. Modern manufacturing demands flexibility of equipment layout, because of the relatively short periods of time between changes of product design and manufacturing methods, either of which may necessitate equipment relocation.

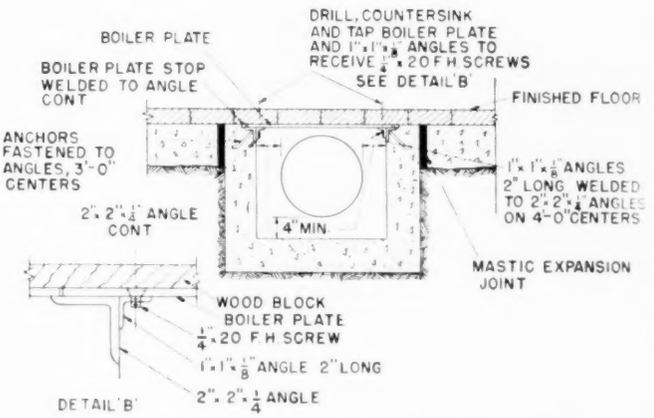

BOILER PLATE
DRILL, COUNTERSINK AND TAP BOILER PLATE AND 1" x 1" x 1/8" ANGLES TO RECEIVE 1/4" x 20 F.H. SCREWS
BOILER PLATE STOP WELDED TO ANGLE CONT
SEE DETAIL 'B'
FINISHED FLOOR
ANCHORS FASTENED TO ANGLES, 3'-0" CENTERS
1" x 1" x 1/8" ANGLES 2" LONG WELDED TO 2" x 2" x 1/4" ANGLES ON 4'-0" CENTERS
2" x 2" x 1/4" ANGLE CONT
4" MIN.
MASTIC EXPANSION JOINT
WOOD BLOCK
BOILER PLATE
1/4" x 20 F.H. SCREW
1" x 1" x 1/8" ANGLE 2" LONG
2" x 2" x 1/4" ANGLE
DETAIL 'B'

Fig. 1. Method of installing dust conveying ductwork underground.

Fig. 1, 2, and 3 show several standard methods of installing dust conveying ductwork underground. If the governing labor codes permit. Fig. 3 provides the most economical method as no sheet metal ductwork is required below the floor surface. Where sheet metal ductwork is required, Fig. 2 is the most economical method because of lower installation and maintenance costs.

In all three cases, thickness of boiler or checker plate is determined by the width of the duct and the loads to which the plates may be subjected. In some cases it may be found necessary to reinforce the steel plates with structural steel.

With Fig. 1, care should be given to the location of cleanouts in the underground sheet metal ductwork so that a minimum number of floor blocks will be torn up in the case of duct stoppage. The usual installation procedure is to completely assemble and solder the sheet metal ductwork on the floor and lower the assembled section into the trenches. In large installations sections are flanged in convenient lengths for handling, and the sections are then lowered into the trenches and bolted together. Loose companion flanges are recommended to compensate for any misalignment.

The only advantages that Fig. 1 possesses over Fig. 2 are that it is better from a safety viewpoint as it minimizes the hazards of slipping on metal surfaces, and it presents a better appearance.

If ground water is present in any of the three cases shown, it is advisable to use an integral waterproofing compound that is mixed directly with the concrete used to form the sides and bottom of the trenches. In extreme cases it may also be advisable, in addition to the previous statement, to apply waterproof linings to the inside of the concrete surfaces.

Shape of Ducts

Whenever conditions permit, square or rectangular galvanized sheet metal ductwork should be used in preference to round galvanized sheet metal ductwork because of its lower cost. While square or rectangular galvanized ducts are used almost exclusively in heating, ventilating, and air conditioning systems, judgement must be used in using them for exhaust systems. Square or rectangular ducts should not be used where dust is being conveyed for: 1. Prohibitive cost of making all the joints air tight, 2. Because of the possibility of dust lodging in the bottom corners of the duct and eventually causing duct stoppage. Furthermore, you would not employ square or rectangular galvanized ducts where vapors were being removed as the condensation on the inside of the ducts would leak out through the joints unless the joints were water tight. Systems removing toxic or explosive substances cannot utilize square or rectangular ductwork unless every joint is air tight.

Installation Applications

Some typical applications for square or rectangular ductwork for exhaust systems where the joints do not have to be air or water tight are:

(1) Removing vitiated air from toilets, restrooms, offices, restaurants, bars, auditoriums, gymnasiums and other public gathering places.

(2) On the clean air side of exhaust systems where the dusts are neither toxic nor explosive.

If conditions necessitate the use of welded black iron ductwork, local conditions determine whether round or square ducts should be used. Tinsmiths usually are limited by their trade unions as to the gauge of metal with which they can work. Below a certain gauge, it may be necessary to use another craft. Available shop equipment then usually determines the economy of duct shape.

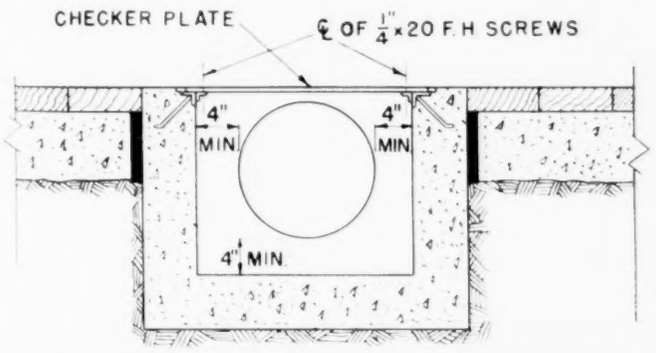


Fig. 2. Another method of installing dust conveying ductwork underground.

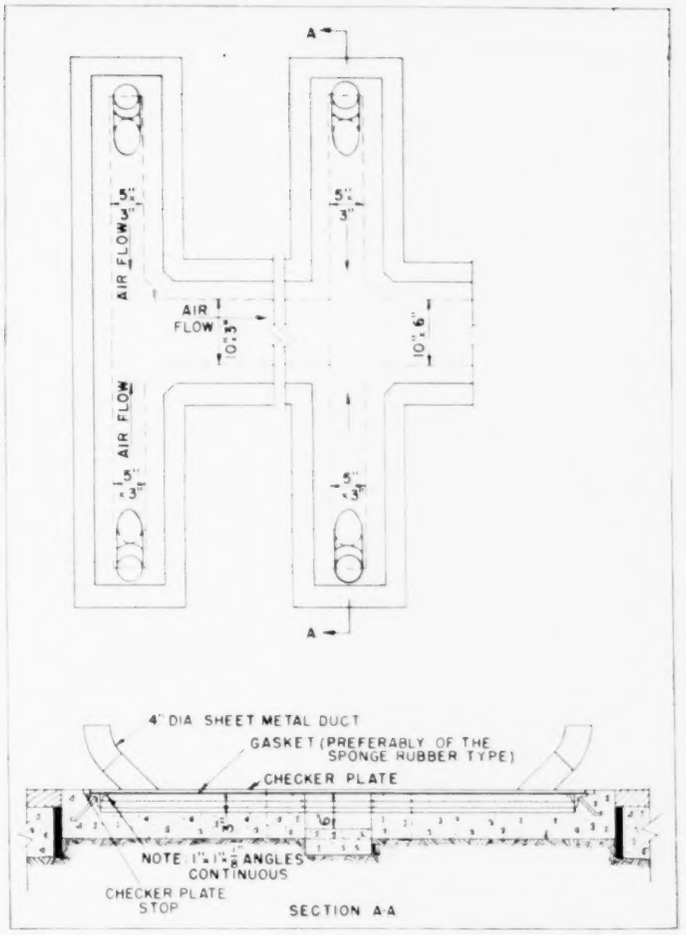


Fig. 3. Plan for installing underground ductwork that eliminates sheet metal below the floor surface.

Use of Dampers

Dampers are used in exhaust systems for some of the following reasons:

(1) To prevent outside cold air from entering heated areas when the exhaust system is not in operation.

(2) To regulate air flow in the branches of a system.

(3) To completely shut off branches, when not required, and thus keep down installation costs.

(4) To prevent air from moving in undesired directions.

In No. 1, heat losses are kept at a minimum if the dampers are located at the point where the ductwork leaves the heated area. If the air within the ductwork is clean or non-corrosive it is a fairly simple matter to purchase and install a standard parallel blade type motor or solenoid operated damper that is electrically interconnected with the fan motor so that it is fully opened when the motor is started or fully closed when the motor is stopped.

However, if the conveying air is dust ladened or is carrying corrosive fumes, with its attendant deposit of salts, the inexpensive butterfly damper of Fig. 4

may prove quite efficient. This type of damper must be installed in the suction ductwork as its success is entirely dependent upon the use of outboard bearings and the flushing action of the room air that is being drawn into the duct along the shaft of the damper. This shaft must be parallel to the building floor so that when the system is shut down, condensation within the duct will not drip out of the ¾ in. diameter shaft holes in the duct. This damper can be operated manually by a chain, or motor or solenoid operated

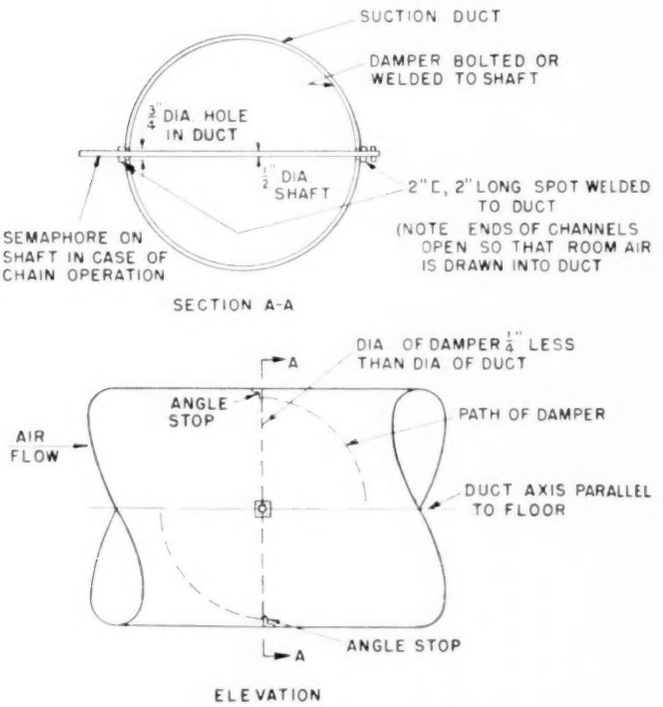

SUCTION DUCT
DAMPER BOLTED OR WELDED TO SHAFT
¾" DIA HOLE IN DUCT
½" DIA SHAFT
2" E, 2" LONG SPOT WELDED TO DUCT
(NOTE ENDS OF CHANNELS OPEN SO THAT ROOM AIR IS DRAWN INTO DUCT
SEMAPHORE ON SHAFT IN CASE OF CHAIN OPERATION
SECTION A-A
DIA OF DAMPER ¼" LESS THAN DIA OF DUCT
A
ANGLE STOP
PATH OF DAMPER
AIR FLOW
DUCT AXIS PARALLEL TO FLOOR
A
ANGLE STOP
ELEVATION

Fig. 4. Details of a damper design.

from the fan motor circuit. Corrosion treatment of the damper and shaft within the duct is usually the same as that of the interior surface of the duct.

Some labor codes forbid the use of dampers in exhaust systems except for use in balancing the systems. These are the dampers noted in No. 2. Blast gates are generally used and some labor codes specify that they must be secured after the proper setting has been obtained. Satisfactory dampers of this type can be found in most of the fan manufacturer's catalogs.

Blast gates are also used to accomplish the objective of No. 3. However, most labor codes specify a maximum number of branch pipes that may be closed at one time. This feature introduces complications in piping design which requires a thorough investigation of possible combinations of branch pipe closings. The designer must size his ducts in the case of dust conveying so that certain closings will not lower duct velocities to the point where dust will drop out of the air stream and plug the ducts.

Dampers to satisfy No. 4 can be of several types, depending upon the particular installation. If the damper is to be a check valve to prevent reverse flow then it can be of the single blade or butterfly type. If it is to be used to switch air flow from one duct to another, it is usually a single blade damper inserted in the junction of the ducts in such a manner as to close off the opening to one duct when it opens the other duct.

In the case of dust or fume collecting systems, the governing labor codes usually specify the distance that the stack must extend above the roof line or the distance from the point of discharge to the nearest building opening. Furthermore, the codes usually specify that the vertical discharge pipe must be protected by a weather cap against the entrance of rain or snow or by other suitable means except in those cases where no damage will result to the exhaust system if snow or rain enters the stack.

Of course, the standard weather cap can be replaced by an elbow followed by a short length of duct with the end cut at a 45° angle. The elbow should be parallel to the direction of the prevailing wind and the exhaust air should be discharging in the same direction as the prevailing wind.

Use of Goure

In the case of fume collecting systems, it is quite often desirable to discharge the fumes vertically upward so as to minimize the nuisance should some of the fumes reenter the building. Some designers like to use evase' stacks to benefit by the static pressure regain. In either case some provision must be made to take care of the snow or rain. The usual method is to install a goure, Fig. 5, beyond the bottom of the vertical duct and within the building. The goure should be of such size that the water will not rush past it and into the other parts of the system. Usually a 2 in. pipe coupling is either welded or soldered to the bottom of the goure and a 2 in. dia. pipe line led to a place of disposal. A valve located in the 2 in. pipe line permits regulation of the quantity of air either pushed into or withdrawn from the building. A 2 in. dia pipe is used to prevent rapid plugging of the drain line. Occasionally, during a rainstorm, the pipe valve is opened wide to flush out the line. Incidentally, whenever vapors pass through a fan it is a good practice to weld a 1 in. pipe coupling in the bottom of the fan scroll and pipe from the coupling to a place of disposal. Fan blades are designed to move air and will, therefore, break if rotated in a liquid which is many times heavier than air.

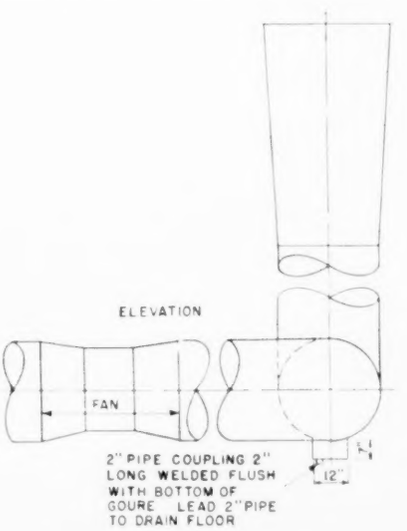


Fig. 5. Goure is employed in duct to take care of snow and rain.

Air Conditioning Cuts Rust Spoilage

NATHAN N. WOLPERT
Associate Editor, Heating and Ventilating

Production of ball bearings to extremely close tolerances and exact quality control, largely possible through air conditioning. Effect of air control on personnel described.

AIR conditioning at the two Philadelphia plants of S K F Industries, Inc., manufacturers of ball and roller bearings, has been responsible in part for a reduction in rejects from all causes to as low as 3% of the total production. Among the causes for rejects are: (1) Formation of rust on the bearing parts during the manufacturing process; (2) The presence of dirt and other foreign matter in the assembled bearings. With the assistance of air conditioning, the use of which dates back to 1936, the Philadelphia company has developed a technique in the manufacture of its products which has been successful in achieving high quality since it is now possible to assemble bearings to extremely close tolerances without the need for a protective coating of rust preventative. Because of this long experience with air conditioning, a visit was made to S K F to learn how atmospheric control has affected production, the quality of the final product, and what effect it has had on plant personnel.

At present, the company has two plants in Philadelphia, but during the war it also operated an artificially-lighted and air-conditioned windowless plant at Gwynedd in nearby Montgomery County.

At the Gwynedd plant, high-precision bearings were manufactured for aircraft, including the extremely small bearings for the Norden bomb sight. The low torque bombsight and aircraft instrument bearings had to revolve freely even when touched with the tip of a camel's hair brush. Not only was atmospheric control necessary to reduce the possibility of rust forming on these small bearings during the manufacturing process, but the air had to be dust free in the area these bearings were assembled. In fact, women employees were not permitted to don makeup or nail polish or to eat in certain critical areas. All of these bearings were assembled in a specially-air conditioned area within the air conditioned plant. At both the Gwynedd plant, and at Plant 2 in Philadelphia, located several miles from the main plant, inspections of small steel balls and rollers were made by girls working in front of a glass shield so that moisture from the breath would not condense on the metal; lint-free gloves were worn to prevent perspiration from reaching the finished product.

It is the company's firm belief that production of such vitally important bearings for the bombsight and other extremely precise applications would have been virtually impossible in a plant without adequate air conditioning.

Some interesting observations were made regarding the effect of air conditioning on the personnel at the Gwynedd plant. During the war years, a large number of elderly men and women were employed. Many complaints concerning draft were made by these persons, particularly the women, and conditions were corrected where possible by shifting desks. In general, it was noted that employees who worked while seated were sensitive to drafts, but that those who worked around machines or at standing or moving jobs seldom complained.

As the Gwynedd plant was the first fully air conditioned structure to be erected in that part of Pennsylvania, workers recruited from that area had to be educated and trained to working in atmospheres of controlled temperature and humidity. When employees wished to change jobs during the war years, a valid

Fig. 1. Final inspection room, Plant No. 2. Air complaints were eliminated by pointing up air outlets.

excuse for the move had to be given to the U. S. Employment Service. A considerable number of persons blamed air conditioning for a variety of ills, but investigation by competent medical authorities proved most cases to be imaginary. It was definitely felt that a large number of these cases was due to claustrophobia or morbid fear of confined spaces, engendered by the windowless plant.

Air conditioning, which is now employed at the main plant and at Plant 2 is used as means for humidity and temperature control and to provide dustless air in the assembly, final inspection, and packing areas. It has made possible the adherence to extremely close tolerances in the gauging of balls and rollers, thus facilitating the final assembly in one plant of the products produced in both plants.

An effort is made to keep air in the controlled part of the main plant at a temperature not to exceed 80F and relative humidity about 50%. Rust usually starts in the non-air conditioned zone to be later detected during inspection in the air conditioned section.

The low percentage of rejections in final inspection —two to three per cent of the overall total—would be impossible without air conditioning and the methods of cleanliness employed, the Quality Control department points out. During the summer months, about one per cent of the rejects are due to rust spots resulting from perspiration. During the winter months, when the workers do not perspire as freely, the number of rejects due to rust is reduced to as low as one-fourth of one per cent.

One of the operations performed in the final inspection of bearings is a so-called "noise" test in which bearings are placed on a rotating shaft and the noise level indicated in decibels on a testing apparatus. One of the reasons for rejection at this particular inspection operation is the excessive amount of noise caused by the entrance of microscopic particles of dirt or other foreign matter on the ball path.

One-half of Plant 2 is used for manufacturing balls and rollers, the other for machining the rings which later go to Plant 1 for hardening, grinding, etc. The air conditioning system consists of 3 25-hp compressors and Westinghouse precipitrons. As the system has a greater capacity for the area conditioned than at Plant 1, the temperature is maintained at 74F and 34 to 36 R.H. It is possible to lower this relative humidity, but workers would then be troubled by drying of the nasal membrane.

Even with air at 75F and 36 R.H. it was not uncommon to find that rust spots had formed on the completed work in the interval between the time the plant closed down at night and operations were resumed the next morning. An early method for correcting this was to store the products in wooden boxes in which a light bulb was kept burning to lower the humidity of the air within the box. The method now used, and which has proven most effective, is a small closed room where the temperature is maintained at 110-120F with 10 R.H. As fast as work is completed, it is moved to this "hot" room. Only enough parts are taken from this storage that can be finished or assembled or packaged within a few hours.

Fig. 2. To avoid moisture from breath and hands on small steel balls and rollers, inspection is made behind glass, and inspectors wear special gloves.

Parts removed from the hot room are protected for some time or until the temperature is brought down to room temperature. It was found that where the work or parts are warmer than the atmosphere, no rust forms. Where the parts are cooler than the surrounding atmosphere, the moisture in the air will condense on the metal to start rust. The hot room was found to be the best method for offsetting the effects of relative humidity for long periods.

Originally the air outlets from ducts, Fig. 1, were directed downward, but this caused a number of complaints about drafts. Now the outlets are pointed up and the draft complaints have become less frequent.

When the parts are finished and inspected, they are slushed in grease and then packed for delivery to parts or finished stores. When the parts are to be assembled, the slushing compound is removed by washing. Because of the thin film remaining, it would be impossible without air conditioning to prevent corrosion.

Many years ago, before S K F operated its present plants, the ball factory was located at the junction of two railroads and was not air conditioned. It was not uncommon to find that rust had set in two to three hours after the work had been completed. Even more recently, when the air conditioning equipment in one of the plants failed to function properly for two days, rust developed on the steel tables and bearings.

While there was an absence of records to compare operations of the present air conditioned plants with the old one that was not air conditioned, the various officials who are concerned with production and with quality control are not a bit backward in proclaiming that air conditioning is in large part responsible for the present high quality of the finished product and for the low percentage of rejects as compared to the total production.

Aluminum Pipe and Tubing

By PAUL BRANDT
Technical Service Department, Reynolds Metals Co.

Data to help evaluate the use of aluminum pipe for heating and ventilating work.

BESIDES the advantage of light weight, certain aluminum alloys have strength properties comparable to, and in some cases exceeding, those of structural steel. Compared to other metals, aluminum stands third on the scale of malleability, fifth in ductility, and is exceeded only by silver and copper in regard to electrical conductivity. These qualities would serve to make aluminum a natural choice for heating and ventilating applications even before its high thermal conductivity and notable corrosion resistance are considered.

As can be seen in Fig. 1 the cost advantage of using aluminum is constantly increasing. This metal cost over three times as much as the same volume of zinc in 1932 and cost 30% more than copper. Today, on an equal volume basis, copper costs are four times and zinc costs two times more than aluminum. It cannot be denied that aluminum is constantly gaining price-wise advantage over most other popular metals used in industry.

There are over 20 different alloys available today, each of which is designed to give a certain combination of advantages. So, it is necessary that the proper alloy be chosen when any certain set of demands must be met.

Pricing Information

Aluminum tubing and pipe, as well as pipe fittings, are available in both standard and extra-heavy iron pipe sizes. The sizes range from ⅛ in. to 8 in. IPS, or in non-standard sizes from ⅛ in. tube with 0.010 in. wall thickness to 8 in. pipe with wall thickness up to one-half inch. In cases where there is demand, this range of sizes can be exceeded. Besides tubing or pipe in the round form, there are supplied square and rectangular sections, also elliptical, hexagonal, and octagonal shapes.

Strength and Weight

Aluminum weighs 33% as much as steel, 31% as much as brass, and 29% the weight of copper.

Strengths available in alloys go from the low extreme in which nearly pure aluminum (2S) has a yield strength of 5,000 lb per sq in. to an ultimate strength of 77,000 lb per sq in. in R303. In most cases, where strength is of first importance, the R361-T (61S-T) alloy is chosen since it is equivalent to structural steel in this regard. Strength properties of the more popular alloys are listed in Table 1.

Bending

The properties which affect the bendability of any material are its ductility and stiffness or strength. A tube having good ductility but little strength will elongate in bending, but will collapse, while in cases where there is strength without ductility (as in the case of glass) fracture will occur. It is necessary that a combination of these properties be enjoyed that successful bending be accomplished.

The proper measure of ductility is the amount of material will elongate under tension before fracture. This elongation is measured in percent of the length of the piece being tested. From Table 1, it is seen that the alloy designated as 2S-0 is the most ductile of the group. This is followed by 3S-0 and 52S-0 which can be stretched 40% and 30% respectively.

While the foregoing ductility values do not directly indicate the minimum radius to which a tube of a certain alloy can be bent, the use of these values in conjunction with Table 2 will give the recommended minimum radii. The recommendations of Table 2 are made on the assumption that proper tube bending equipment is used including mandrels. It is seen from this table that 2S-0 tubing will have bending characteristics similar to 23-13 stainless steels, 25-20 stainless steel, and that ordinary low-carbon steels can be compared to 52S-0 as well as R361-0 and R361-W.

The quality of stiffness which is necessary for the making of good bends is largely dependent upon wall thickness of the tubing or pipe. Standard IPS material has ample stiffness to negotiate the bend radii noted in Table 2. In cases where sections lighter than

Fig. 1. Weighted average prices for primary aluminum. Based on Metal Statistics 1947 published by American Metal Market.

the IPS are to be bent, it should be remembered that larger minimum radii are required if the wall thicknesses are less than 0.049 in. for tubing or pipe 2 in. dia or less; 0.061 in. applying for sizes between 2 and 3 in. dia; 0.077 in. for 3 to 4 in.; and 0.108 in. for pipes of over 4 in. diameter.

Alloys to be Used

The proper choice of metal, bend radius, and forming tools naturally governs the success of any bending operation. This is equally true in the case of aluminum as it is for other metals. Although ordinary tools employed for general tube bending can be used for this metal, it is advisable that the tools be free of dents, rough edges, and surface irregularities which might tend to score or cause general damage. For the more severe bends it is suggested that the softer and lower strength alloys be chosen. In this respect 2S or 3S in the *O* temper (annealed) are most applicable. Where the bend is too severe for these alloys, even when proper tooling and lubricants are utilized, it is suggested that working at elevated temperatures not exceeding 400F, greatly increases the formability.

Welding

Aluminum is one of the most readily weldable of all metals. Welding, as used in this discussion, includes metal-arc welding, carbon-arc welding, atomic-hydrogen welding, as well as inert-gas-shielded welding, oxy-acetylene welding; torch, furnace and dip brazing. It also includes resistance welding methods such as spot, seam, and flash.

Some welders have erroneously concluded that since aluminum welding techniques differ from those employed in steel, it is not a weldable material. However, if the characteristics of the metal are understood it readily proves itself an easy material to join by welding. There are two factors which should be borne in mind when welding.

1—The melting point of aluminum is about 1,200F where that of steel is approximately 2,700F. This immediately indicates that one will not successfully weld the metal if he employs steel techniques. Because the temperatures used in aluminum welding are not within the visible light range, it is not easy to determine when the melting temperatures are approached in the portion being welded. This differs from the circumstances involved in welding other metals where the temperature of the metal is indicated by the color of the heated piece, which can thereby be heated to any desired range.

2—The oxide coating which covers all exposed surfaces of aluminum. This oxide, which is so definite an advantage in its corrosion protection, has a melting temperature above that of the base metal. This being true, the aluminum becomes molten beneath the oxide film which remains tough and prevents proper fusion of parts. It is, therefore, necessary to remove the oxide film before successful welding can be accomplished. Wire brushing is usually sufficient to affect removal but if the surfaces are heavily oxidized a light etch may prove necessary. Immersion in cold 10% sulphuric acid for about 30 min or in a 5% solution at 150F for 5 to 10 min, will remove the heaviest films. Another answer is to immerse the parts in a

Table 1—Typical Properties of Aluminum Alloys

Alloy	Temper	Strength Ultimate	Strength Yield (Lb per sq in.)	Elongation %	Brinell Hardness 500 kg load	General Description
2S	0	13,000	5,000	45	23	Combines formability, weldability, corrosion resistance, thermal conductivity, low cost.
	½H	17,000	14,000	20	32	
	H	24,000	21,000	15	44	
3S	0	16,000	6,000	40	28	Combines formability, weldability, corrosion resistance, thermal conductivity, medium strength, low cost.
	½H	21,000	18,000	16	40	
	H	29,000	25,000	10	55	
52S	0	29,000	14,000	30	45	combines formability, weldability, corrosion resistance, medium strength.
	½H	37,000	29,000	14	67	
	H	41,000	36,000	8	85	
R361 (61S)	0	18,000	8,000	30	30	Equivalent strength to structural steel (R361-T), corrosion resistant, weldable.
	W	35,000	21,000	25	65	
	T	45,000	40,000	17	95	
17S	0	26,000	10,000	22	45	Good strength and hardness.
	T	62,000	40,000	22	105	
R301	0	25,000	10,000	22	...	High strength with corrosion resistant clad surface.
	W	62,000	40,000	19	...	
	T	68,000	60,000	10	...	

cold 10-15% solution of nitric acid for 10 to 20 min. Either procedure should be followed by a thorough rinse in hot or cold water.

As the various alloys have their individual

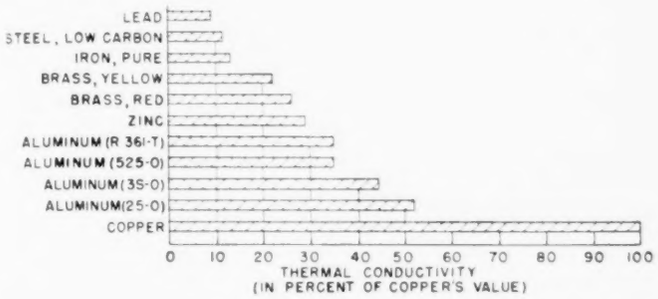


Fig. 2. Relative thermal conductivity of metals with copper considered as unity.

mechanical properties, it is well to mention that certain of these are more easily welded than others. The purer alloys called 2S and 3S are the most weldable of the family; these are followed by 52S which is resistance welded as easily as 2S and 3S but is more difficult to fusion weld. Of the heat-treatable alloys R361 heads the list in weldability. The dural group, such as 17S, 24S, and R301, are more properly resistance welded because fusion welding impairs corrosion resistance as well as embrittles the metal.

Soldering

Aluminum can be successfully soldered by either of two techniques.

The first or flow type method uses a solder of about 50-75% tin with the balance being of zinc. A flux is applied to the heated surface for the purpose of attacking or dissolving the oxide film after which the solder is applied in molten form.

The second or friction method relies upon mechanical means for breaking down the oxide film. In this case the solder is rubbed onto the aluminum surface while that surface is being brought to sufficient heat to melt the solder. The rubbing action breaks through the oxide allowing molten solder to adhere to the parent metal.

Soldering temperatures range from 200-700F depending on the type of solder used. The proper temperature can be obtained by using a conventional soldering iron or an air acetylene welding torch with a No. 24 tip. Because aluminum has high conductivity, heat applied to the proposed solder area is rapidly dissipated. For this reason the gas torch method of heating should be used where gauge thicknesses exceed 0.040 in.

Soldering joints are generally no stronger than the solder material used. Consequently, this method of joining is not recommended where strength is a requisite unless the joint is designed in such a way as to supply the desired strength through the use of lock seams, riveting, bolting, crimping, or similar appropriate means.

Aluminum can be soldered to steel, brass, and copper. In soldering to steel and brass, the aluminum is tinned with an aluminum solder, while the steel or brass is tinned with an ordinary lead-base solder. The metals can then be joined by fusing the solders together. In joining copper to aluminum both metals are tinned using an aluminum solder.

Galvanic Action

When dissimilar metals are used in direct contact a corrosion problem is created. This problem is of little consequence until moisture is introduced, at which time an electrolytic, or galvanic, action is set up which compares very closely to that process existent within a wet cell battery.

Electrolysis is an action which takes particles from one of the metals (the one of higher electrolytic potential) and plates these upon the other metal. In this way the first metal, which corresponds to the cathode of the wet cell, slowly is eroded until it will completely disintegrate.

This problem exists with aluminum used in direct contact with other metals, and while it is an undesirable situation, it can be remedied by making contacting surfaces of the two metals moisture proof. One of the more popular preventative measures employed is the painting of surfaces with zinc chromate primer prior to joining. Under certain circumstances it is expedient to use bituminous base paints or even heavy oils and grease in the same manner as the zinc chromate.

There are commercial preparations on the market which take the general forms of paint, paste, impregnated tape, or grease. Since these preparations have characteristic advantages for certain type applications,

Table 2 – Minimum Radius of Bend

% Elongation of Material	Up to 2 in. Wide (or Dia.)	2-4 in. Wide (or Dia.)	Over 4 in. Wide (or Dia.)
	Times Width		
10	5	6	6
20	2½	3	4
25	2	2½	3
30	1¾	2¼	3
40	1¼	2	3
50	1	1½	2½
60	1	1½	2½
70	1	1½	2½

Table 2 reproduced by permission of Wallace Supplies Mfg. Co., Chicago. Various metals which lie in ductility ranges listed are given here. For other materials, consult reference books dealing with their properties:

10%—High carbon steels as rolled; magnesium alloys.
15-25%—High carbon steels; chrome steels; nickel steels; 17S, 24S, 52S aluminum.
25-30%—Low carbon steels, as rolled; chrome-vanadium steels.
30-35%—Low carbon steels; 8-20 stainless steel.
35-45%—24-13 stainless steel; 25-20 stainless steels; 2S, 3S, aluminum.
45-60%—18-8 stainless steel.
60-70%—Phosphor-bronze; silicon bronze; copper. All metals in annealed condition except as noted.

Table 3 – Aluminum Corrosion Performance in Contact with Various Chemical Agents

Good	
acetanilide	paraldehyde
acetate solvents, crude	petroleum oil
acetate solvents, pure	picric acid
acetic acid	potassium chlorate
acetic anhydride	potassium sulfate
acetone	propane gas
acetylene	propylene glycol
alcoho's	shellac, orange
ammonia gas	shellac, bleached
ammonium hydroxide	sodium metaphosphate
ammonia liquors	sodium nitrate
ammonium bicarbonate	sodium perborate
ammonium nitrate	sodium peroxide
ammonium phosphate (di-basic)	sodium phosphate
ammonium phosphate (tri-basic)	stearic acid
beer	sulfur
beet sugar liquors	su fur dioxide, dry
benzoedehyde	sulfur trioxide, dry
benzene	tar
benzol	tartaric acid
benzine	toluene
benzoic acid	trinitrotoluene
boric acid	turpentine
butane	varnish
butylenes	vegetable oils
butryric acid	water, distilled
butadiene	
cane sugar liquors	**Poor**
carbolic acid	ammonium chloride
carbon dioxide, dry	calcium chloride
carbon dioxide, wet	chlorine, wet
carbon disulfide	copper sulfate
carbonic acid	ferric chloride
carbonated beverages	ferric sulfate
citric acid	formic acid
coal	hydrochloric acid
coke oven gas	hydrofluoric acid
creosote	magnesium chloride
dairy products	magnesium hydroxide
ethers	mercuric chloride
ethylene glycol	mercury
formaldehyde	nickel chloride
freone, wet	nickel sulphate
freone, dry	nitrating acids (15% solution)
furfural	phosphoric acid, crude
gasoline	phosphoric acid, pure
gelatine	potassium hydroxide
gluconic acid	sodium carbonate
glucose	sodium cyanide
glue	sodium hydroxide
glycerin	sodium hypochlorite
glyceryl phosphate	sodium phosphate (tri-basic)
glycerol	sodium silicate
hydrogen cyanide	sodium sulfide
hydrogen gas	slude acid
hydrogen peroxide	sulfate liquors
hydrogen sulfide	water, acid mine
lacquers	zinc chloride
lacquer solvents	**Marginal**
lactic acid	acetic acid, crude
magnesium sulfate	acetic acid vapors
methyl salicylate	aluminum sulfate
milk	alums
molasses	borax
natural gas	calcium bisulfite
nitrating acids (1% solution)	carbon tetrochloride
nitro-g'ycerin	chromic acid
nitric acid (80% and above)	potassium chloride
oleic acid	sodium bicarbonate
oxalic acid	sodium bisulfate
oxygen	sodium chloride
palmitic acid	sodium thiosulfate
	sulfurous acid
	vinegar
	water, salt

it is well to make careful selection of the material to be employed for use under a specific set of circumstances.

The joining of dissimilar metals, especially where soldering is employed, must be done mechanically. This means that bolting, riveting, the use of lock seams, crimping, or threading must be employed. Any form of mechanical joining which is applicable to a given project can be used as long as preventative measures are employed to take care of the galvanic problem.

Chemical Stability

While the oxide film mentioned previously gives the metal decided anti-corrosion advantages it does not insure immunity to all forms of attack. There is no one metal which enjoys complete immunity or which will give the best corrosion protection under all circumstances. Table 3 is designed to indicate aluminum's resistance to attack by various compounds.

The resistances to corrosion are specified as good, poor, or marginal. In the first case, aluminum can be used in the transfer of storage of, or in direct contact with the materials so classified. Its use is not generally recommended in connection with those in the poor classification, while with those listed as marginal the adaptability, while doubtful, depends upon individual circumstances.

Thermal Conductivity

The superior thermal conductivity of aluminum is an important factor governing its usefulness in heating and ventilating applications. This conductivity makes the metal useful in any project where heat transfer, or dissipation, is important.

Fig. 2 shows the relative thermal conductivities of various metals based upon the conductivity of copper. It can be seen that, except for silver and gold which are not included on the chart, 2S-0 aluminum ranks second to copper and conducts heat a little better than half as rapidly as copper under the same conditions. Of the metals shown, lead is the poorest conductor having a value of about 9% that for copper.

As aluminum is alloyed with other elements, its rate of heat conduction is measurably decreased. In the case of one alloy not discussed herein the reduction in conductivity is to about one-half that of the leading 2S-0 alloy. A second factor affecting this property is the hardness or temper of any alloy. In the *O* (annealed) condition, the best conductivity is realized, and as the temper rating is increased toward either the *H* or *T* the ability to conduct heat decreases.

A relatively pure alloy such as 2S or 3S in the annealed condition (2S-0 or 3S-0) will give the best heat transfer properties of the aluminum family.

It is not generally recommended that aluminum or its alloys be used where sustained temperatures exceeding 400F are encountered, but there are exceptions to this rule.

Steam Main Pushed Under Highway

to avoid traffic congestion due to open trench

GEORGE W. HAMLIN

Commissioner, Division of Water and Heat, Cleveland, Ohio

Construction details of how steam main was extended under Cleveland's principle traffic artery to serve buildings on other side of avenue.

HOW to lay an underground steam main across Cleveland's most travelled highway without interfering with the automobile traffic was the problem that had to be solved before steam service could be extended.

Carnegie Ave., the street to be crossed, is a six-lane highway that in the course of a day was used by more than 28,000 passenger cars and buses. The last traffic count was made in 1944 at a time when gasoline rationing prevailed as a war economy measure. Whatever plan was approved for extending the main across the highway, could not materially hamper the flow of automobile traffic.

On the other side of the highway dangled a luscious plum of increased load for the city's central steam heating system. Since 1912, Cleveland has been operating such a system in the Euclid-East 105th St. and Carnegie area. To serve several South Side Carnegie Ave. buildings, which represented a sizable potential steam load, it was necessary to cross Carnegie Ave. and to extend a steam feeder line about 100 ft.

Added Revenue Possible

Cleveland, which has operated an extensive central heating system since 1912, supplying street steam to the Euclid-East 105th St. and Carnegie area, was confronted with just such a problem in an endeavor to supply heating service to several South Side Carnegie Ave. buildings which presented a sizable potential steam load. Since the buildings were situated at East 105th St. and the steam distribution mains directly across Carnegie, less than 100 ft separated the acquisition of this additional revenue source to the Cleveland system.

Our office, aware of the traffic engineers' 1944 survey, and the overwhelming traffic increase since then, foresaw dire consequences resulting from heretofore conventional methods of installing underground pipe lines, particularly at such a busy transit system crosstown. Closing Carnegie Ave. would have necessitated rerouting traffic to other nearby streets which definitely were not capable of handling such an increased traffic volume.

Meetings, which were held with the city engineering staff, produced the suggestion to tunnel under Carnegie Ave., employing such a design and construction that the tunnel would not exceed 8 ft in depth because of the possibility of interference with other underground utilities. It was important that the tunnel be amply reinforced to prevent cave-ins during construction and after the new steam line was cut into service. The procedure for installing the heating line and the material and equipment utilized in its construction are indeed interesting and worthy of consideration by any American city faced with a similar situation.

A pit 6.5 by 15 ft was excavated at the curb-line on the southeast corner of the intersection from which a 3 ft diameter tunnel was started in a due north direction ultimately to extend to a manhole directly across the street, a distance of 82 ft.

Fig. 1. Operator jacking tunnel casing through as excavation is being made. Geared track is shown in foreground. This is the pit from which digging was started under the street.

Fig. 2. Workmen at far end removing dirt by means of small hand car moved out inside the casing.

We selected Armco No. 8 gauge spiral welded iron casings for tunnel construction after it was proved that the 10 ft sections provided were fully capable of sustaining the continuous impact imposed by extremely heavy overhead traffic loads on Carnegie Ave., even with but 5 ft of cover. To insure against injury to the galvanized coating of tunnel casings as they were pushed through horizontal excavation, a metal jacket was lap-welded around the exterior corrugated surfaces of the sections.

Special geared tracks (see Fig. 2), facilitated pushing the tunnel casing into horizontal excavations as digging progressed. This track was laid only in the pit from which the tunnel was started. The track provided leverage for jacks used in pushing the tunnel piping forward as the digging progressed. Track was removed from the pit after the tunnel had been completed under the street.

Naturally, since the tunnel was only 3 ft in diameter, dirt in advance of the pipe was excavated into a hand car and then pushed out through the inside of the pipe. Since there was danger of a cave-in, the face was only excavated 6 in. in advance of the end of the casing.

When a 10 ft long tunnel casing was completely driven in, a new section was lowered and coupled with casing in the tunnel, bonded by a special bolted coupler. At first, hand jacks were used to push the pipe into position, but after the line had increased to a number of these bolted sections, two 75-ton hydraulic jacks were used. After street crossing was completed, the bottom of tunnel casing was paved with concrete to assist the jacking operations required to install the steam conduit.

We installed Ric-wil insulated pipe units in the completed tunnel. These units, entirely factory prefabricated in 21 ft lengths, were easily and quickly telescoped into the tunnel, and steam service connection made to accommodate new customers on the other side of the highway.

Completion of the project required a total of 3 24-hr working days, which resulted in an installation cost considerably less than the customary utilization of labor gangs to open this busy street, install underground piping, and replace pavements. All tunnel construction and pipe line installation was handled by the City of Cleveland's Maintenance Department, under the direction of R. N. Mumma, assistant engineer.

It is interesting to note that the Central Heating service for the Euclid-East 105th St. area originates from the remote Fairmount Municipal Pumping Station. The general practice of municipal water pumping stations throughout the country is to waste exhaust or excess steam after process and plant heating requirements have been satisfied. Yet in this instance, the Fairmount Station, by control of this excess steam and supplement of some live steam, has been able to provide a useful and revenue producing commodity for sale to an adjacent (Cleveland's second largest) commercial community.

In all, 131 customers are served with 237 million pounds of steam annually, and much of the credit for absence of smoke in this area can be attributed to the street steam system.

We are confident that we need not be concerned about the installation nor the efficiency of this particular steam pipe extension for many years to come, and feel the additional steam load taken on well warrants the construction costs involved. In the event the satisfactory results we obtained from this extension can be utilized by any other Cleveland steam utilities who plan future extensions of their system under city streets, our engineering drawings of this line will be made available.

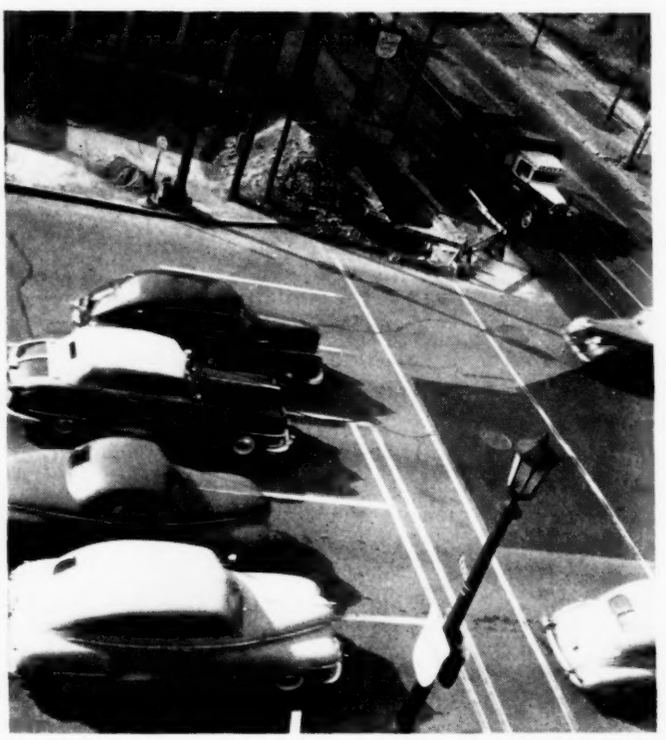


Fig. 3. Looking across busy Carnegie Avenue. In the background is the pit from which the tunneling work started.

HEAT TRANSMISSION THROUGH INSULATING GLASS UNITS

THE data which follow are calculated values for U to be used in estimating winter heat losses. They apply to prefabricated glass windows in double panes separated by a dehydrated air space. Such windows are also available in triple panes, with two air spaces.

Information on heat loss through glass windows is widely scattered and many of them are apparently inconsistent. This is not too surprising considering the number of variables involved.

The heat transmission coefficient for glass can be calculated by the formula

$$U = \frac{1}{\frac{1}{f_o} + \frac{1}{f_1} + \frac{x}{k} + \frac{x_1}{k} + \frac{x_2}{k} + \frac{1}{a} + \frac{1}{a_1}}$$

where U = Btu per sq ft per hour per F, f_o = the outside film coefficient, f_1 = inside film coefficient, x = thickness of glass in inches, k = conductivity of glass, x_1 and x_2 = thickness of second and third pane if any, a and a_1 = conductance of the air space (s) between panes, if any.

The value of the film coefficients varies with the air velocity over the surface. The inside coefficient f_1 is usually taken at 1.65. Rowley and Algren (University of Minnesota) show that f on a glass surface at zero air velocity ranges from about 1.4 at 40F mean temperature to 1.7 at 85F mean temperature. The value 1.65 therefore appears somewhat high but is used here because it is commonly accepted.

The same investigators show values for f at higher wind velocities, suitable for f_o, ranging from about 4.8 at 5F mean temperature to 5.5 at 80F with an air velocity of about 15 mph. The value of f at 35F mean temperature is 5.1 so that a round value of 5.0 for a wind velocity at design (15 mph) air velocity seems reasonable.

The conductance of the air space between glass panes varies with the mean temperature and the thickness of the air space, increasing with the former, decreasing with the latter. Consequently, U as calculated for a temperature of 35F in the air space as intended for 0 to 70F design conditions will differ from the U calculated at a mean temperature of 50F for a 30 to 70F design condition.

With glass it is entirely possible for the room to be losing heat by conduction at the same time it is receiving radiant energy from the sun. This only adds to the confusion in attempting to assign an exact value to U.

In addition, the value of k for glass is by no means standardized. Smithsonian Physical Tables give a value of 7.3 Btu per sq ft per inch per F per hr, while British publications give 5.5. McAdams gives a range of values from 3.6 to 7.3. A value of approximately 2.0 is given by one investigator.

In calculating Table 1, a mean temperature of 30F is assumed in the air space between a double glass unit. For a triple glass, 20F is assumed in the outer air space, 40F in the inner space. Values of 1/a for the air spaces of ¼ and ½ inch are as follows, based on the date of Rowley and Algren: at 20F, for ¼ in., 0.73; for ½ inch, 0.91; at 30F, ¼ in., 0.70; ½ in., 0.87; at 40F, ¼ in., 0.67, ½ in., 0.84. Table 1 was calculated on the basis of a 0 to 70F temperature difference.

The figures in Table 1 of course apply only to a sealed-in air space. The value of U for an ordinary glass window .08 in. thick is about 1.13. A conventional wooden storm window ordinarily has a rather large air space between it and the

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window, so that the value of 1/a is relatively high, thus holding the resultant *U* value rather low. At 30F, the value of 1/a is as follows for various air space thicknesses: ¼ in., 0.70; ½ in., 0.87; ¾ in., 0.925; 1 in., 0.935; 1¼ in., 0.937; 1½ in., 0.938. In other words, nothing is gained by having the air space over 1½ in. thick. As a matter of fact, Rowley and Algren report no practical gain in using an air space over 0.8 in. thick. With the air space 1½ in. thick, and with ordinary window glass, the *U* value as calculated would be 0.56. Note, however, that this value assumes a tight fitting storm window whereby 30F would be maintained in the air space; just how closely the usual storm window would meet this ideal is questionable, and a higher value than 0.56 should probably be used for the conventional storm window.

Table 1—Heat Transmission Coefficients as Calculated for Insulating Glass Units

Thickness of Glass, Inches	Thickness of Air Space, Inches			
	¼		½	
	No. of Panes of Glass			
	2	3	2	3
	Value of *U*, Btu per Sq Ft per F per Hr.			
⅛	.61	.42	.56	.37
¼	.57	.38	.52	.34
⅜	.53	.36	.49	.32
½	.50	.34	.46	.30
⅝	.47	.32	.44	.29
¾	.45	.30	.41	.27
⅞	.42	.28	.39	.26
1	.40	.27	.37	.25
1¼	.36	.25	.34	.23

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What Happened in New York

• 54th Annual Meeting, American Society of Heating and Ventilating Engineers

• 8th International Heating and Ventilating Exposition

A brief review of events at the concurrent heating and ventilating exposition and ASHVE annual meeting is presented on this page. Abstracts of papers presented at technical sessions are on the four pages following, and new equipment introduced at the exposition is so designated in the News of Equipment and Materials section beginning page 106.

Eighteen hundred members, guests and ladies registered for the fifty-fourth annual meeting of the American Society of Heating and Ventilating Engineers held at the Hotel Commodore, New York City, February 2-5. Held simultaneously at Grand Central Palace, the 8th International Heating, Ventilating and Air Conditioning Exposition, which occupied four complete floors at the Palace, attracted tens of thousands of men associated with the field from the United States, Canada and foreign countries, including England, Czechoslovakia, India, Denmark, Sweden, Austria, and Switzerland.

Prominent among the technical sessions at the ASHVE convention were those devoted to radiant heating and the heat pump. At the former, in addition to three technical papers, reports were read by the various chairmen of the society's recently formed committee on panel heating and cooling.

This work was described by G. D. Winans, Assistant Superintendent of Central Heating, Detroit Edison Co., Detroit, Mich., chairman of the Committee on Panel Heating and Cooling. Chairmen of three of these committees are L. N. Hunter, vice-president, The National Radiator Co., Johnstown, Pa.—Heat Transfer Within and Behind the Panel; John James, research engineer, Iron Fireman Mfg. Co., Cleveland—Heat Transfer Between the Panel and the Space; J. S. Locke, sales manager, Air Conditioning Controls Division, Minneapolis-Honeywell Regulator Co., Minneapolis—Controls for Panel Heating. The fourth committee, Physiological Aspects of the Problem, has not been formed.

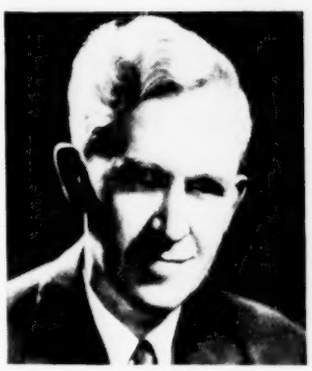
At the same meeting, the Heating, Piping and Air Conditioning Contractors National Association, Chicago, presented the society with a check for $1,000 with no restrictions, for use in radiant heating research, the first year's total cost of which was estimated at $25,000.

At the heat pump symposium four papers were presented covering various aspects of this subject. In addition, a brief talk was given by one manufacturer of heat pumps, and this was followed by a lengthy discussion period.

Randolph H. Carpenter, New York manager, Nash Engineering Co., was toastmaster at the annual banquet at which William B. Stout spoke on these Human Miracles.

New officers of the ASHVE are G. L. Tuve, Professor of Mechanical Engineering, Case School of Applied Science, president; A. E. Stacey, Jr., Carrier Corp., first vice-president; Lester T. Avery, Avery Engineering Co., second vice-president; Lauren E. Seeley, Dean, College of Technology, University of New Hampshire, treasurer.

The convention was arranged for by a committee headed by Walter E. Heibel, general chairman, with the following vice-chairmen: P. B. Gordon, H. S. Johnson, Carl F. Kayan, C. S. Koehler and H. J. Ryan. Chairmen of the various committees were as follows: Banquet, W. A. Swain; Entertainment, Howard J. Rose; Exposition, C. F. Roth; Finance, W. M. Heebner; Publicity, Clifford Strock; Reception, M. C. Giannini; Sessions, H. S. Birkett.



Newly-elected officers of the ASHVE are, from left to right: president, G. L. Tuve, Professor of Mechanical Engineering, Case School of Applied Science; first vice-president, A. E. Stacey, Jr., Carrier Corp.; second vice-president, Lester T. Avery, Avery Engineering Co. Lauren E. Seeley, (not shown) Dean, College of Technology, University of New Hampshire, was elected treasurer.

PAPERS PRESENTED AT NEW YORK MEETING

Following are abstracts of technical papers presented at ASHVE's 54th Annual Meeting.

It is possible to predict the heat output of a radiant heating panel within an average of 3%, according to experiments conducted by R. S. Leigh, Chase Brass & Copper Co., and R. G. Vanderweil, consulting engineer, and reported in their paper, "Measurement of Heat Output of a One-Square-Foot Panel."

A graphical method of determining panel heat output was proposed by Dr. F. E. Giesecke and adapted by Vanderweil, from which charts for both flow and ceiling panel design, was employed. The authors conducted 161 tests on a one square foot panel, 111 being in the floor position, 50 in the ceiling. The tests were conducted over a range of common room air temperatures and room wall temperatures.

Comparison of the test results with that indicated by the chart for corresponding conditions, showed that the maximum deviation of test results from the chart was ± 10%, but the average for all tests was only ± 3%, although the range of panel heat output was large—from 27 to 125 Btu per sq ft (panel) (hour). The magnitude of the deviation was not related to the position of the panel, whether ceiling or floor, nor to the proximity of cold glass surfaces.

State Ventilation Laws

An analysis of the various state industrial ventilation codes shows that legal requirements in regard to factory ventilation vary sharply from state to state, eleven states having no codes at all, and that a majority of states have codes which are inadequate or impractical. The analysis was made by Knowlton J. Caplan and Allen D. Brandt, in their paper, titled "State Laws Concerning Industrial Exhaust Ventilation." The authors included a four-page table summarizing the situation state-by-state. Mr. Caplan is ventilation engineer, Michigan Department of Health, and Dr. Brandt is industrial hygiene engineer, Bethlehem Steel Co.

The authors show that 25 states have only very general requirements concerning the health conditions in industry, and that only six states have what may be regarded as a reasonably complete code or set of standards covering a number of typical operations or exhaust hood types. Of those states having rather complete codes, two of them contain the design requirement that the area of the main should be equal to the combined area of the branches plus 20%. This criterion is recognized as being poor and inadequate for many types of systems.

With respect to particular operations, grinding and buffing were the most thoroughly covered, being mentioned by 12 states, five of which use the codes of the American Standards Association or closely similar data, and seven of which use standards other than ASA codes. Some of the non-ASA standards are far from practical. Spray coating and mine and tunnel ventilation were next in order of popularity, being covered by seven and six states respectively. There was little agreement in the requirements for these operations. The remainder of typical industrial operations was scattered throughout the legislation, more than 25 operations being covered sporadically.

After concluding their analysis, the authors recommended that specific and quantitative design criteria should not be included in legislation. Rather, such data, standards and recommendations should be incorporated in regulations or in advisory standards accompanying regulations in order that greater flexibility may be obtained. Furthermore, some means should be provided for the approval of control measures in those few instances in which the health hazard is adequately controlled, even though the control measures do not meet the standards and were provided under circumstances which do not fit the typical conditions upon which the standards were based.

Heat Pump Economics

The economics of the heat pump favor commercial as compared with residential installations for the next few years in the opinion of W. E. Johnson, Manager of Engineering, Air Conditioning Department, General Electric Co., in a paper entitled "Economic and Technical Aspects of the Heat Pump."

In his study Mr. Johnson concluded that for year-round air conditioning in the home the most favorable market for the heat pump will be found in the more southerly part of the U. S. where the design heating requirements are about equal to the design cooling requirements, and where the home owner is able and willing to pay for summer air conditioning as well as heating. This places the market for the heat pump in houses in the field of higher priced homes.

Commercial applications were favored by the speaker because of the higher internal heat gain in this type of application as compared with houses. This heat gain, from human beings, lights, motors, other sources, tends to reduce the winter heating load and increases the summer cooling load, thus giving a more desirable balance between the loads and the two seasons.

An analysis of a typical case by Mr. Johnson showed that the individual cost of the heat pump is determined by the summer and winter loads down to a 40F winter design temperature. Below this the cost of equipment is determined by the summer cooling load. However, in a commercial building where there is sufficient internal heat given to maintain a 15F temperature difference, the loads become equalized at 12F instead of 40F. Consequently, commercial applications will be economically feasible much farther north than will house installations.

In Mr. Johnson's opinion the heat pump is com-

petitive in modern design temperature regions where the cost of electrical energy is one cent per kilowatt-hour or less. An indication of the operating cost based on two commercial and one residential installations is that the power consumed ranges from ½ to 2/3 kilowatt-hour per degree-day per installed horsepower of the compressor.

The heat pump also has possibilities in the industrial field, Mr. Johnson's analysis showed. It has not been used in U. S. industry prior to this time because fuels are cheap, whereas in Switzerland it is rather extensively used because fuel is expensive and water power cheap and plentiful. A situation somewhat similar to Switzerland is found in western and northwestern sections of the U. S. where water power is plentiful and coal expensive.

Mr. Johnson cited one industrial process as being ideal for the application of the heat pump, namely, the concentration of solutions such as milk, fruit juices, and syrup. This can be accomplished by any of three methods; multistage evaporation, direct compression of vapor, and indirect compression. With a four-stage evaporation system, for example, he showed that three pounds of steam can be evaporated for one pound of steam used, with resultant important savings.

Air Discharge from a Long Slot

The important factor in the design of a long slot in a dead-end duct intended for ventilation, mixing, air shielding or smoke dissipation, is the ratio of the area of the slot to the area of the duct, according to the results of a joint research project sponsored by the American Society of Heating and Ventilating Engineers and Case Institute of Technology.

The authors, who presented the report of this study under the title "The Discharge of Air from a Long Slot," were Alfred Koestel and G. L. Tuve, both of Case Institute of Technology. They included a method of design for long slots in dead-end ducts and showed that their tests agreed with a mathematical analysis in that the final direction of the air stream in the room can be obtained by adding vectorially the individual velocities at each increment of slot length.

Largest Heat Pump Installation

The largest heat pump installation in the U. S. was described in a paper by J. Donald Kroeker and Ray C. Chewning in a paper "A Heat Pump in an Office Building". Mr. Kroeker is a consulting engineer of Portland, Ore., and Mr. Chewning is a member of his staff.

Automatic switch-over from heating to cooling or the reverse is provided in the installation described—that in the 12-story Equitable Building in Portland. The heat pump is particularly adapted to regions such as the Northwest U. S. where electric rates are low.

The installation employs well water as the source of heat, and the heat in this water is utilized for heating the building in winter at a cost of only the energy needed for "pumping" the heat to the desired level. Features of the installation described include heat recovery from exhaust ventilation air and heating of ventilation air with waste cooling water.

The Equitable Building is the first non-utility office to be heated by a heat pump in this country. Comprised of 12 rental office stores, basement, and two penthouse levels, the building rises 200 ft above the street; is 200 x 100 ft at the street level and 62 x 200 ft at the third floor and above; has a floor space of 212,000 sq ft, and a volume of 2,275,000 cu ft; is the first all-aluminum-clad building in the country; and incorporates some unusual architectural features, such as fixed, double glazed, column-to-column windows flush with the building faces throughout, neither horizontal nor vertical exterior reveals, and utmost flexibility of repartitioning without affecting electrical and mechanical factors.

Fire Control in Buildings

A method of controlling fires in multi-story buildings by which the fire is confined to the floor on which it started, was covered in a paper "A Method of Fire Control," by A. C. Bartlett, assistant manager, heating and air conditioning department, Sturtevant Division, Westinghouse Electric Corp.

Tests of the method conducted with a fire in a mock escalator setup sponsored by Otis Elevator Co., Westinghouse Electric Corp., and Grinnell Co. An exhaust fan was used to reduce the air pressure on the flow where the fire is located; in addition, a water curtain was produced around the escalator wellway to cool and reduce the volume of gases. Such a system is not a fire extinguishing system, the author said. It is, rather, a method of controlling fire by confining it to the floor on which it occurs until the fire department arrives. This permits people in the building to escape and prevents panic.

With this system, when a fire starts on the second floor, for example, pressing of a button causes the following actions to occur simultaneously:

The exhaust fan on the roof starts;

The fresh air intake on the roof opens;

A damper in the duct to the exhaust fan from the second floor is opened;

The escalator stops, and all ventilating or air conditioning apparatus stops, and

The fire department is notified.

Mr. Bartlett emphasized that the object of the method is to confine the fire, and control it, at least until the building can be cleared.

Downward Projection of Heated Air

Distribution of heated air when projected into a room has been the subject of considerable study by heating engineers, the most recent of which was a paper "Downward Projection of Heated Air" by Linn Helander and C. V. Jakowatz, both of the Department of Mechanical Engineering, Kansas State College.

In their paper, the authors describe the general characteristics of a heated air stream projected downward from a 6.5 in. round duct and from a 5.75 in. convergent nozzle. In addition, they compared their

test results with calculations showing what would have been expected, the calculations being made on the basis of formulas developed analytically.

The maximum blow with the 6.5 in. opening was somewhat larger than calculated; for the nozzle, the actual blow was in close agreement with the calculated.

Panel Heated Room Gradients

Locating radiant panel heating coils in the floor results in more uniform air temperatures from floor to ceiling than is the case with either wall or ceiling, according to a paper on "Air Temperature Gradients in a Panel Heated Room," by J. M. Ayres and B. W. Levy, both graduate assistants in the School of Mechanical Engineering, Purdue University, where the test house in which the research was conducted is located.

The tests reported were performed in the living room of the test house. The tests were run as closely as possible to outside temperatures of 15, 30 and 45F outside temperatures. The air temperatures were measured by 14 thermocouples mounted on stands and at 1 in. above the floor and below the ceiling and at twelve immediate points.

The results of this investigation indicate that floor panel operation caused uniform air temperatures within ½F between one foot above and below the floor and ceiling respectively; this uniformity was maintained independent of load. The ceiling panel gradient, however, shows a maximum variation of 8 deg. between the same points and a minimum variation of 4.5 deg., the variation increasing with load. Air temperature gradients for exterior wall and interior wall panel operation exhibited almost identical curves and were an approximate mean between the floor and ceiling gradient shapes.

Since these investigations concern only one structure, further tests of the same type in buildings of different construction and under different loading conditions would prove of interest, the author concluded.

Friction Equivalents for Ducts

New data for determining the friction loss of air flowing in rectangular ducts were presented by R. G. Huebscher, research engineer of the ASHVE Research Laboratory in a paper "Friction Equivalents for Round, Square and Rectangular Ducts."

In 1945 an air friction chart for round ducts was presented before the society by D. K. Wright, Jr. Mr. Huebscher's paper establishes a relationship between that friction chart and rectangular and circular ducts that enables the design engineer to estimate with a greater degree of assurance the resistance of rectangular ducts in terms of circular equivalents.

The object of the research reported by the author was to determine whether, with low air velocities in small ducts, the theory which holds in hydraulics would apply, namely that with ducts of different cross-sectional forms, the ducts having the same ratio of cross-sectional area to perimeter will have the same friction when the length and velocity are equal. Tests on a round, square and rectangular duct of the same equivalent diameter under velocities from 300 to 9310 fpm indicated that the theory is correct. The maximum variation from the mean did not exceed ± 5.0%.

Practical results from the paper include a table of rectangular duct size equivalent to circular ducts from 3.8 in. to 100 in. in diameter. This table is computed from the formula

$$D = 1.30 \sqrt[5]{\frac{(ab)^3}{(a+b)^2}}$$

where D is the circular equivalent in inches of a rectangular duct for equal friction and capacity, and a and b are the sides of the rectangular duct in inches.

Solar Transmission Through Glass

A progress report on a study of solar heat transmission through flat glass was given in the form of a paper from the society's Research Laboratory in Cleveland, and was prepared by George V. Parmalee, Warren W. Aubele, and Richard G. Huebscher, all members of the laboratory staff.

Besides a knowledge of the fractions of direct and diffuse radiation which pass through a given type of glass, it is great practical importance to be able to account for the heat absorbed by the glass, the authors stated. Its passage to an air conditioned space is governed by convection conditions at the indoor and outdoor surfaces and radiation exchange between the glass and its indoor and outdoor surroundings. The latter includes not only the ground and neighboring buildings, but also the atmosphere itself which is a partial absorber of low temperature radiation.

Considerable information concerning some of these factors has been secured from the fixed angle tests reported by the authors. In order to extend this information and to approximate it for actual installations, a number of tests were made in which the glass was held in a fixed position with an approximately fixed temperature difference between indoors and outdoors. From all of these tests it is expected that a treatment can be developed which will account for the dissipation of solar heat absorbed by the glass as it is affected by various factors.

Heat Transfer of Walls

In predicting the load on a summer air conditioning system, the heat transfer through the walls must be determined. Data have been published on calculating this but previous published data have not taken into account the variables of inside and outside wall surface coefficients; instead these have been treated as constants.

A paper in which the inner wall coefficients is also a variable was presented by Harold A. Johnson of the University of California. His paper was on "Periodic Heat Transfer of the Inner Surface of a Homogeneous Wall."

Air Filter Tests

Buyers of air filters should be furnished by the manufacturers with performance curves containing complete families of curves, in the opinion of R. S. Farr, W. N. Pauley and K. A. Crismon, Los Angeles, Calif., expressed in a paper, "An Improved Test Method for Rating Air Filters." The paper listed the requirements of an air filter testing method and summarized a proposed test code.

In the authors' judgement, the first approach to developing an adequate test code lies in eliminating those variables in air filter testing other than test dusts. The authors have developed a test duct, dust feeder and dust sampler which allows the test dust to be evenly distributed within ± 5 percent, and the air velocity within 15 to 20 percent. Simultaneous dust sampling is used. The authors further recommend that all test data be plotted in full. The methods of arriving at average efficiency and resistance figures which have been in use in some air filter test methods are misleading. Since the main purpose of a test code is to provide means for reliable analysis of air filter performance only complete curves or families of curves at various velocities, or test data using various specified test dusts will enable the engineer to design his air filter installation to suit his particular needs.

The authors believe that if other laboratories interested in establishing a satisfactory air filter test code should adopt the improved equipment described in this paper, a coordinated investigation of still unsolved problems, including the complicated problem of suitable test dusts, could be undertaken.

Use of Weather Data in Design

"Normal weather data should not be interpreted as applying to 'usual' conditions," according to a warning by H. E. Landsberg in a paper "Use of Climatological Data in Heating and Cooling Design." Mr. Landsburg also emphasized that the average is of much less importance than the frequency distribution of the data.

As an example, the author, who is a member of the Committee on Geophysical Sciences, The Joint Research and Development Board, Washington, D. C., mentioned the winter design temperature of zero degrees F commonly used in that city. This temperature, he said, occurred only 3 times in 48 years, and he suggested that a design temperature of 10F for Washington would take care of 99.9% of all cases.

Mr. Landsburg also cautioned heating engineers that in hilly country micro-climatic differences within a few miles are quite important, and pointed out that temperatures in suburban areas can differ as much as 8 degrees from that at metropolitan weather stations.

Winter Design Temperatures

Heating systems are designed to maintain a given temperature inside a building when the temperature is at some low point previously experienced a number of times, but not so low as the lowest temperature of record. Generally, the design temperature for any locality is one based on experience but not selected to a consistent pattern.

"A New Method for Selecting Winter Design Temperatures" was proposed in a paper by Clark M. Humphreys of the ASHVE Research Laboratory.

The author stated that the outside design temperature is too important a factor to be determined by any rule of thumb on the basis of one cold day. Instead, it should be so selected that it will indicate with a fair degree of accuracy, the lowest temperature which is likely to prevail long enough or occur frequently enough in an average winter to justify consideration.

Based on his analysis of weather data for 23 heating seasons in 120 cities, compiled under his direction with WPA funds in 1938, the author proposes that winter design temperatures be selected on the basis of probable frequency of recurrence of low daily mean temperatures. The winter design temperature could be defined as the lowest daily mean temperature which is likely to recur frequently enough during the average winter to justify consideration.

Tables of frequency of occurrence of low temperatures for 120 cities were given by the author, who further made the point that:

"It is difficult to justify the common practice of using the same design temperature for all buildings in a given locality. Actually, the proper design temperature might be expected to vary with type of construction and with occupancy. The high thermal capacity of most structures makes it unnecessary to consider low temperatures of short duration. It therefore follows that heating systems for structures having very low thermal capacity or very high infiltration rates should be designed for a lower temperature, or for a mean temperature having a lower probable frequency of recurrence. A greenhouse might be a good example of this type of structure."

Mr. Humphreys believes that design temperatures in the U. S. are too low in most cases, and added three reasons, other than the frequency data, to support this conclusion, as follows:

1. The daily minimum temperature usually prevails for such a short period of time that, because of heat storage within the structure, its effect on the heating load is negligible.

2. It is customary to make heat loss calculations and design heating systems on the assumption that the system must furnish all of the heat to the space. This is never true. Instead, the average building receives appreciable quantities of heat from the sun, light, occupants, mechanical processes, and other extraneous sources. The room heaters which have been sized for 100% of the calculated room loss are helped by the exposed or concealed piping to them.

3. A system that is oversized is difficult to control and may cause more discomfort in average winter weather than a somewhat smaller system will cause on a few extremely cold days. The smaller system will also be lower in first cost and will operate more efficiently throughout the heating season.

Methods of Joining Cast Iron Pipe

J. E. YORK

Building Service Engineer, Stone & Webster Engineering Corporation

This is the first of three articles covering the types of joints used for connecting cast iron pipe. This month's section deals with bell and spigot pipe, packings, and joint materials. The present series is an extension of Mr. York's group of articles which, in past issues, has described the general methods of joining pipe.

ALTHOUGH joints for cast iron pipe are commonly of the bell and spigot type, screwed, bolted and flanged joints are also available.

The bell and spigot joint was invented by Thomas Simpson, engineer of the Chelsea Water Company, London in the year 1785, and has been used extensively ever since for underground water mains and with modifications for other services. This type of joint as shown in Fig. 1 conforms to the American Water Works Association Standard and can be obtained in pipe sizes 3 in. to 48 in. for pressure classifications from 100 to 800 ft head.

A section of pipe may have two bell ends but is generally furnished with one bell end and one spigot end. The joint is commonly made by sliding the spigot end into the bell end, inserting packing material and pouring molten lead into the space between the spigot piece and the bell, and calking the lead after it has cooled.

The bead on the spigot end serves to center it in the bell end and to prevent the packing being forced beyond the end of the spigot. The groove on the inside of the bell provides a means for anchoring the lead into the bell and thus prevents it from being blown out by the internal pressure on the system.

As lead joints are poured with molten lead which contracts as it cools, it is necessary to calk the joint to insure that the space between the spigot piece and ths bell is solidly filled with lead, and the joint is tight.

Packings

Materials used for packings for bell and spigot joints include jute, hemp, cotton, oakum, paper and rubber.

Jute which is made from vegetable fiber may be obtained in loosely twisted strands or braided with circular or square cross section. The fibers of jute are long, soft and lustrous but are not as strong as hemp fibers. They are not water repellent, lose their strength when damp, and frequently become a breeding place for bacteria. In order to kill bacteria, the jute may be treated before use with suitable chemicals or heated in an autoclave to sufficient temperature to destroy the bacteria.

Hemp, which is also a vegetable fiber, is stronger and more durable then jute and withstands much better the effects of moisture. As its first cost is higher than jute, it is not as commonly used.

Cotton packings are not commonly used as they are more expensive than jute or hemp.

Oakum usually is made from old hemp ropes by untwisting, pulling into loose fiber and treating with tar. It is usually cheaper to use old hemp rope than to use new hemp fiber to make oakum. An inferior grade of oakum is made from jute fibers. The use of oakum is usually confined to joints in sanitary and storm water drain piping and sewers.

Rubber is commonly furnished as a packing material for special forms of bell and spigot joints which will be described later.

Joints in which paper was used for packing have been found in such good condition after many years of service that it was possible to read printed material on the paper. Commercial paper packings are now available and one well-known manufacturer of jointing material regularly advertises and recommends the use of sanitary, bacteria-free paper packing that costs about 30% less than jute, for use with his jointing material.

Yarning of the bell and spigot joints is usually started before the spigot end enters the bell as this step centers the spigot in the bell and thus insures a uniform thickness of joint all around.

A well-known cast iron pipe manufacturer states that when yarning a joint, each strand of yarn should be cut somewhat longer than the circumference of the pipe so that the ends of the strand will overlap, and that overlapped ends of successive strands should be staggered. The separate strands should be driven home with a yarning iron and hammer and when the last

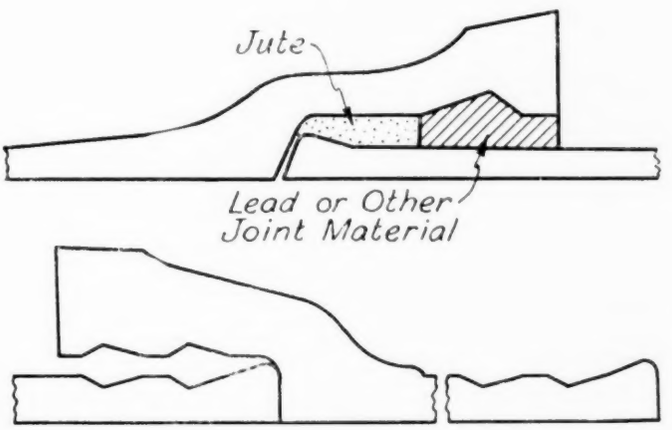


Fig. 1, upper. Bell and spigot lead and jute joint.
Fig. 2, lower. Joint with double lead groove.

one is in place all strands thoroughly compacted in order to insure a tight joint. Sufficient yarn should be used to fill the joint up to within two inches of the bell face.

Joint Materials

Jointing materials commonly used are molten lead, lead wool, self-calking, self-sealing pipe joint compounds, cement, and bituminous compounds.

When making poured joints a runner is fitted tightly around the outside of the spigot piece and against the face of the bell. The joint material is poured in while hot and then allowed to cool and to solidify before the runner is removed. Use of a funnel when pouring joints in horizontal pipes is desirable to provide sufficient pressure to completely fill the joint and prevent formation of air pockets.

Where molten lead is specified for joint material, the use of old scrap lead is usually prohibited. New pig lead should be used.

Lead joints should be calked thoroughly. The best practice requires that each calking tool be used from the smallest to the largest that will fit in the joint space and that the joint be completely calked around with each tool. For large jobs the use of pneumatic calking hammers is recommended. While their use results in better calking and lower costs, some experience is required with the air hammers to avoid excessive calking so as to prevent splitting the bells.

If there is moisture in a joint which is to be poured with molten lead, it is advisable to use oil or powdered rosin to prevent blowing.

Calked joints on rain water leaders outside a building where they are exposed to frost should be packed with some non-absorbing material, such as common

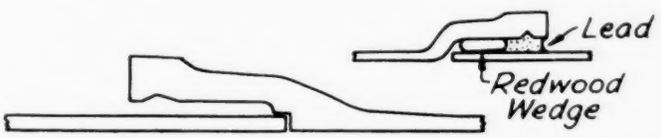


Fig. 3, left. Standard bell and spigot super de Lavaud pipe for water mains. Fig. 4, right. Form of bell and spigot joint employing a redwood wedge as a stop for the lead.

putty; otherwise the expansion due to freezing will work the lead out of the joint.

An increase in temperature causes lead to expand, but when it cools it does not contract an equal amount. If steam or very hot water is discharged to a bell and spigot system with lead joints, the result is that the lead is finally worked loose and the joint leaks. If it is necessary to discharge very hot water or steam to sewers, provision should be made for introducing sufficient cool water to reduce the temperature below 140F.

Lead wool is ordinary lead made in shredded form and usually furnished in the shape of loosely made rope. With this joint material the packing is usually inserted to within $1\frac{1}{8}$ to $1\frac{3}{8}$ in. from the face of the bell, and the lead wool is then placed in the joint one strand at a time. Each strand is calked before inserting the next one. A lead wool joint is generally more expensive than a poured lead joint, but a thoroughly calked joint of lead wool will resist creeping and greater pressure than a poured joint.

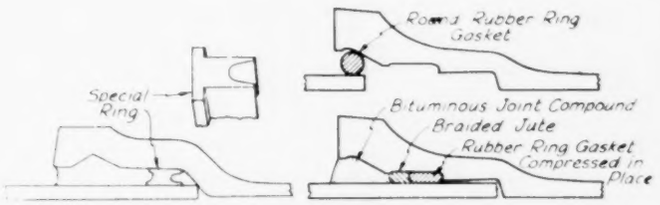


Fig. 5., left. Patented joint with an improved rubber packing ring. Fig. 6, right. Two views showing the steps in making a joint with a round rubber ring gasket.

Joints using lead wool can be made under water if necessary. If a joint is to be made in mucky ground, lead wool may be used as a packing dam to hold back the water, and the balance of the joint made with any compound desired.

Lead wool thoroughly filled with a putty compound of white and red lead in boiled oil makes a very durable joint.

This type of joint was used over 20 years ago and has remained tight on a high pressure water supply entering the basement of a department store in Boston adjacent to a subway station, where the vibration caused by the subway trains had repeatedly loosened the joint material in a standard poured and calked lead joint.

The lead and oil putty as it dries out provides a tight bond between the lead wool and the cast iron pipe, preventing any movement of the lead after the putty has hardened.

Several self-calking, self-sealing compounds for making joints are available. The method of pouring them is similar to that described for molten lead joints; but as they do not contract like lead when cooling, calking is not necessary. It is a common experience that, when water is first turned on in lines with such joints, this type will weep or leak. After the water has been in the pipe for a few days the joints will tighten up and the leakage will cease. Because of this, lead joints are sometimes preferred for lines which are not kept constantly filled.

Sulfur compound joints withstand the effects of vibration such as might occur at a crossing under a railroad track, better than poured lead joints.

When using this type of joint, it is important that the inside of the pipe should be clean and free from any trace of oil in order to insure proper bonding between the jointing material and the pipe.

One manufacturer of a well-known sulfur pipe joint compound states that by adding thiokol synthetic rubber to sulfur jointing compounds, the shrinkage is greatly reduced and this product has some plasticity at the solidification point, thereby reducing the dimensions of the shrinkage void.

Olefine polysulfide is added to a plastic sulfur base compound by another well-known manufacturer to give

greater resistance to mechanical punishment and abrupt temperature changes. The claims advanced for this compound are:

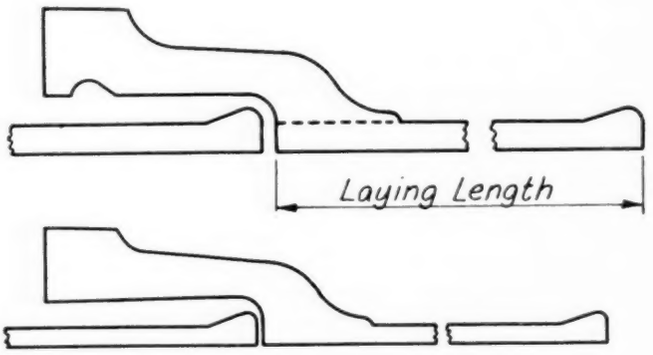


Fig. 7, upper. AGA standard for bell and spigot pipe.
Fig. 8, lower. AGA standard for bell and spigot pipe for cement or combination joints.

(a) Greatly reduced initial leakage. Shorter time required for self-sealing allows faster back-filling and reduced interruption to traffic in busy streets.

(b) The greater resistance to vibration and mechanical shock which it provides in lines under streets, or near buildings containing heavy machinery, reduces maintenance expense and interruptions in service.

(c) Its resistance to thermal shock makes it very desirable for overhead lines or lines carrying hot water.

Paint or enamel coating on cast iron pipe does not prevent the use of sulfur compound joints as such coating usually contains sufficient pinholes or is melted when the hot sulphur compound is poured into the joint so that contact between the sulfur compound and the cast iron pipe is established almost immediately. However, the seal would take place more quickly if the paint or enamel coating were first removed.

While sulfur compound jointing material will permit the flow of sufficient current to permit thawing small diameter service connections, it is advisable where there is any probability of freezing of mains to insert a lead ring ahead of the packing or a lead plug behind the packing in the bottom of the bell to carry the current required for thawing from the spigot end of one pipe to the bell end of the other.

Lead is generally preferred to sulfur compounds for tapping sleeve joints, for several reasons.

Tapping Sleeve Joint

When a tapping sleeve joint is to be used, an excavation is made of sufficient size and depth to permit installation of a split sleeve, a tapping machine valve of a corresponding type, and to permit operation of the tapping machine which cuts out the section of pipe which is to be removed. The excavation generally must be deeper than the bottom of the pipe in order to provide space for the operation of the machine. After the two halves of the sleeve have been assembled on the pipe and bolted tightly together, a poured joint is made at each end of the sleeve.

If a sulfur compound joint is used, a tight bond will be formed preventing any turning of the sleeve on the pipe.

The valve is then connected to the sleeve with either a flanged or a bell and spigot joint, and after the joint has been completed, tested and found tight, the excavation is backfilled.

It is difficult to tamp the backfill for this type of an installation and the earth under and around the joint is therefore not compacted sufficiently to support properly the weight of the valve, the fill on top of the valve, and the traffic over it.

As the joint between the sleeve and the pipe is rigid this may result in breakage of the tapping sleeve. A lead joint permits some rotation of the sleeve on the pipe and thus permits the valve to obtain a solid bearing that results in better service.

Cement Joint

Cement joints are used more extensively in the Pacific Coast area than in other parts of the country.

In a well made cement joint the strength of the bond between the iron pipe and the cement is high and will offer considerable resistance to movement of the pipe or blowing out of a joint. This type joint will be water-tight if well made. It offers a high resistance to passage of an electric current and therefore is not commonly used when mains must be thawed out electrically. A lead ring may be installed ahead of the packing or a lead plug behind the packing in the bottom of the bell to carry the current from the spigot end of one pipe to the bell end of the next.

The method for making cement joints which is recommended by the American Water Works Association in their 1938 Standard Specification for laying cast iron water pipes is as follows:

In making up cement joints, braided jute hemp or other suitable packing material shall be used and the joint space shall not be less than three inches deep. After yarning, the joint space shall be filled with neat cement (Portland Cement) barely moistened (about one quart of cement with ¼ pint of water) and caulked by competent workmen until it is as compact as possible. The cement shall be so dry that it will ring with a metallic sound when being caulked. Cement shall not be used after initial set or after it is wet more than one hour.

Joints shall not be made in wet trenches and no water shall be allowed to touch the joint until the initial set has taken place.

When making cement joints the pipe should first be properly supported to eliminate any possibility of movement before the cement has set. The next step is to insert the yarn which has been previously dipped in a thin mixture of neat cement and water and to drive it home in the usual manner. Extreme care should be taken to be sure that the yarn is absolutely free from oil and grease.

Cement joints shall be covered immediately with

slightly moist earth or with damp burlap for sufficient time to insure complete hydration.

In extremely hot weather, joints should be protected from the hot rays of the sun and should be kept moist for about 48 hours until set. In cold weather, care must be used to prevent freezing of the mortar both before and after making the joint.

Pipe laid with cement joints shall not be filled with water until a lapse of 12 hours after the last joint in any valved section has been made. Pressure shall not be permitted in the pipe until all joints have "aged" at least 36 hours. All joints shall have aged at least two weeks before the pipe is tested for leakage.

Where it is necessary to lay water mains near electric car tracks, the use of pipe joints of cement or a sulfur base compound will frequently be helpful in reducing electrolysis. Cement joints are very commonly used with gas lines for this reason with very satisfactory results. Wooden rings are sometimes inserted in the base of the bell to prevent contact between the two adjacent sections of pipe.

Permissible Deflections at Joints

Underground mains usually must be installed approximately parallel to the centerline of the streets in which they are laid, and may have to be deflected vertically as well as horizontally. When changes in direction are of a limited amount, the use of special fittings is not necessary, as bell and spigot joints can be made with deflection in full pipe lengths as given in Table 1 published by the Cast Iron Pipe Research Association.

AWWA Standard Specification for Laying Cast Iron Pipe suggests that conservative practice would allow one side of the spigot end of a pipe 12 in. or smaller in diameter to be not more than ½ in. from the inside of the bell when the other side is making a metal contact with the other face of the bell. For pipe larger than 12 in. this distance can be increased to not more than ¾ in.

When pipe is laid in accordance with Table 1 the joint opening between the spigot and the inside of the bell should not exceed 0.8 in. and the caulking space should be at least ¼ in.

The joint opening should be limited to the distance given because opening up of the joint reduces the caulking space for small sizes of pipe and reduces the effective bell depth for larger sizes. The barrel of the pipe must not come too close to the bell or adequate caulking cannot be done. Neither must the spigot end be withdrawn too far from the inner face of the bell since sufficient depth must remain for yarn and at least 2¼ in. of lead or 2½ in. of sulphur compound.

Other Forms of Bell and Spigot Pipe

Some of the various modifications of the original bell and spigot joint are as follows:

(1) AWWA high pressure joint, Fig. 2, has double lead grooves in the spigot piece as well as the bell to insure strength and tightness under the high pressures for which it is used.

Table 1 – Deflection with Bell and Spigot Joints

Pipe Size Inches	Bend In One Joint Deg. and Min.	Deflection in Inches per Pipe Length		
		12 Ft.	16 Ft.	18 Ft.
4	4—00	10.0	13.3	15.0
6	3—30	8.8	11.7	13.2
8	3—14	8.1	10.8	12.2
12	3—00	7.5	10.0	11.2
16	2—41	6.8	9.1	10.0
20	2—09	5.4	7.2	8.1
24	1—47	4.5	6.0	6.7
30	1—26	3.6	4.8	5.4

(2) Bell and plain end joint (Metropolitan Types) commonly furnished with centrifugally cast pipes. The spigot in AWWA pipe serves as a means of centering the end of the pipe in the bell and prevents the packing from being forced into the pipe between the spigot and the bottom of the bell. In this type of joint a taper which is provided in the bell serves the same purpose. When laying this type of pipe, Fig. 3, it is customary to place the plain end of one pipe in the bell of the next and slide it forward until it rides upon the taper and automatically centers itself. This type of joint is shown in Fig. 3.

(3) Bored bell and turned spigot pipe. This type of joint has been used extensively in Europe for water lines but is not a recognized standard in this country and is only furnished on special orders. The spigot end as well as the inside of the bell are machined on a slight taper which greatly facilitates the laying of the pipe and makes for tight joints but also increases the pipe cost.

Prepoured Bell and Spigot Joint

(4) A prepoured cast iron bell and spigot joint in which the lead is poured before the joint is made is shown in Fig. 4. This joint can be obtained in diameters of 2 to 12 in. A redwood wedge is used as packing material and the wedge and the lead are placed in the pipe bells at the foundry. As there is no lead to melt or pour at the job, no expensive tools or equipment are required and any man with a caulking tool and a hammer can lay the pipe. Because of a permissible deflection, up to 48 in. in every 54 ft of 2 in., pipe of this type can readily be laid in curved streets without fittings.

Another make of prepoured joint uses a cast iron filler ring, square braided jute (one strand for 3 in. and 4 in. pipe and two strands for larger sizes) and an extra long lead filling which projects beyond the face of the bell, for sealing the joint by caulking the lead flush with the bell face. This joint can be furnished in sizes 3 in. to 12 in. dia.

Use of Rubber Ring

(5) Fig. 5 shows a joint for water lines using a special ring of rubber packing, so designed that the sealing action automatically increases when pressure

exists in the line. The manufacturers state that it is self-locking; self-adjusting to oversize bells; it is made of nonporous molded rubber and cannot become

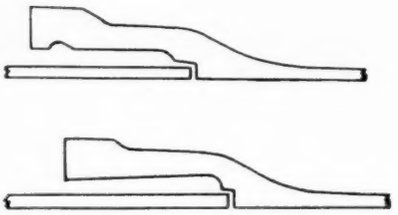


Fig. 9, upper and Fig. 10, lower. Joints for pipe lines carrying gas using two types of gas bell.

a culture point for bacteria or any other contaminating element; it is installed quickly by simply rolling it back over the spigot; it effectively dams off water and assures pouring of dry joints; it can be used with any joint compound.

(6) Roll on Rubber Ring Joints. This joint, Fig. 6, has a special form of bell or socket and a plain spigot end. A cone is used to roll the round rubber gasket to its proper position on the spigot. The spigot is then forced into the socket of the adjoining pipe by the use of a pulling harness. This movement of the spigot into the socket changes the round rubber ring into a link shape and rolls it into position. This automatically sets up sufficient compression in the rubber to seal the joint. The gasket comes to rest against the shoulder or seat provided in the socket. A strand of braided jute is then caulked in against the rubber and wedged below the restriction ring provided in the socket. The rubber gasket is thus confined and under compression in the joint, which are the two prime requisites for long time service. The remainder of the joint space is packed with a bituminous compound, caulked lead, cement or sulfur base compounds as preferred. The flared socket permits deflection in the joints varying from 28 in. in a 16 ft length of 3 in. cast iron pipe to 18 in. in the same length of 12 in. cast iron pipe.

AGA Standard

(7) American Gas Association Standard. This type of joint, Fig. 7, is available in sizes from 4 to 48 in. except 14 in. and 18 in. The bell generally is deeper than corresponding size bells on AWWA pipe. Space between the outside of the spigot piece and the inside of the bell is also somewhat greater. The shape of the recess in the bell offers greater resistance to any movement of the lead and insures a tight joint.

(8) American Gas Association Standard for use with cement or combination joints is shown in Fig. 8. The bell is somewhat deeper, the lead groove is eliminated, and the inside diameter of the bell is slightly larger at the bottom than at the top which anchors the cement in place. With medium pressure gas, alternate layers of lead and cement are sometimes used.

(9) Figs. 9 and 10 show modifications of the two preceding types of joints for use with centrifugally cast pipe.

(10) Bell and Spigot Gas Joints with Southwestern Rubber Rings. Two joints, Fig. 11 and 12, using a special form of packing called Southwestern rubber rings are shown. Pure braided jute and neat cement are used for caulking and completely confining the special joint ring in Fig. 11. Fig. 12 shows lead used in place of the cement of Fig. 11. In either case the gas is prevented from leaking by the special vulcanized rubber ring. Rubber rings of this type can be furnished in all sizes from 2 in. to 48 in. This joint becomes more efficient as it ages. The rings when properly installed in bell and spigot joints and sealed in place with lead and braided jute, or with cement and jute, are self-sealing against gas leaks. The reason for this is that the oils and other hydrocarbons of the gas that come into contact with the materials of the joint are absorbed. This causes a swelling action of the ring material due to the special type of vulcanized rubber. These materials are not affected chemically or deleteriously, but by physical expansion become a permanent barrier to leakage of gas through the joint.

Other types of cast-iron pipe joints will be described in the next article.

Ideal Joint for Gas Mains

An ideal joint for gas mains should withstand the following conditions without material leakage:

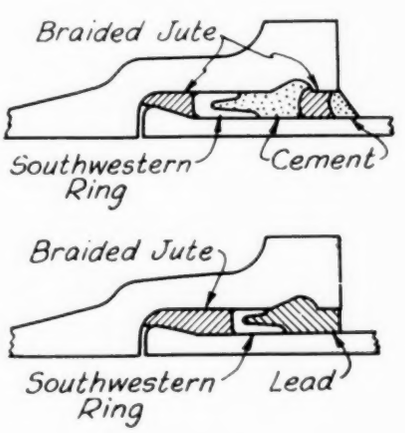


Fig. 11, upper. Southwestern ring used in making a cement joint with bell and spigot pipe. Fig. 12, lower. Southwestern ring used in combination with lead.

1. A repeated temperature change of 20F to 30F (equivalent to expansion of 1/32 in. per 16 ft length of pipe).
2. A lateral or sidewise movement test at least ½ in. at the joint, repeated twice in two directions so as to approximate the condition that occurs when a pipe line settles unevenly.
3. A vibration test which causes two or more unsupported pipe lengths to quiver at repeated and frequent intervals.

References

Further information on the types of joints shown and described in this article may be obtained in greater detail by reference to:

Handbook of Cast Iron Pipe by the Cast Iron Pipe Research Association.

Bulletins of the American Cast Iron Pipe Company Pipe Economy No. 41—James B. Clow and Sons.

THE SALES ENGINEER

Selling the Engineer and Architect

BERNARD LESTER

"CARDS stacked against me on that job", exclaimed a Sales Engineer as we passed a new building bearing the architect's and the contractor's name.

"Why?"

"Oh, I never had a chance. Everything specified against me."

He spoke as though he had been abused, but perhaps he had not used all of the resources available.

Time, relationship, and sales service—these were the factors entering into the loss of this particular job. When plans originated he was not felt. He was not intimate with the consulting engineer. He had not rendered the kind of Sales Engineering service to justify serious consideration.

Consulting engineers and architects' engineers buy no apparatus. They do buy ideas and pay well for them by saying what is to be bought. Selling them differs from selling apparatus to the ultimate user. In the air handling field they play a big part. Intelligent sales methods therefore count for a lot because we know that it costs almost as much to lose an order striven for, as to get it.

First, let us understand clearly the interests of the consulting engineer. His life work is to develop detailed plans for structures and installations which will continue to give the ultimate user the highest degree of satisfaction. With specialized equipment a part of every installation, his job becomes easier if he can rely both on the supplier's engineering ability and apparatus. His reputation is at stake with every installation. It is either a monument or a tombstone for him. Selling the consulting engineer, therefore, becomes a long distance job requiring planning, repeat contacts, and above all, sales service.

Here are some key suggestions that may help the less experienced Sales Engineer to unlock the door of the consulting engineer's office.

(1) Develop a well thought-out plan for action. Study "who's who" in the engineering organization, the likes and dislikes of each, and progress after establishing a foothold, in developing contact from one to the other. Serve well the man who actually prepares specifications, and works on detailed plans. Gain the confidence of individuals who are familiar with what jobs are coming up and the state of activity of each.

(2) Facts, easily understood, and attractively presented, should fill the Sales Engineer's kit bag. Engineering details are only useful insofar as they show results which decrease installation and operating costs, or actually improve the results to be obtained by the user. The consulting engineer is not interested in ball bearings versus sleeve bearings, the exact shape of the fin on extended surface coils, or a thousand other points of construction *except* as they affect installation, operation or maintenance. Therefore, talk construction details only to establish an advantage.

(3) Looking over volumes of manufacturers' technical descriptive matter I am struck in many cases with the fact that such data is prepared from the supplier's viewpoint rather than the viewpoint of the design engineer or user. Much technical information is abstruse, poorly illustrated, and rambling. The Sales Engineer may have a job to do with his home office to get such technical selling data changed, but it's worth the effort. What engineers need so much is pertinent information upon the Sales Engineer's products arranged in such a way that it can be easily used in the hands of the layout engineer. Keeping this information up-to-date is important as well as explaining exactly how to use it.

(4) Some Sales Engineers are weak in simple matters of letter writing and the submitting of proposals. These speak for the Sales Engineer in his absence and the result may be good or bad. Clarity, brevity, completeness and attractiveness all help to sell the Sales Engineer and his apparatus.

(5) No class of customers can use technical information to better advantage than consulting and architectural engineers. It is most important that such information be in the right hands. Changes in personnel occur especially in these times. Keep your mailing lists up-to-date.

(6) Feature in your setting those successful installations you have made. Articles written upon these showing improved techniques, and operating results are often most convincing, and furthermore enhance the reputation of the Sales Engineer.

(7) A real test comes in selling the design engineer when the first installation is put to work. With the job smoothly handled and correctly installed, it serves as a prime opportunity to demonstrate skill to all three —consulting engineer or architect, contractor and owner.

We say the successful installation is a silent salesman. But the Sales Engineer can make it vocal and dynamic. The occasion can be made eventful. Top men to be invited. Systems and apparatus explained and demonstrated. Maintenance facilities recited. Photographs taken and other tools of publicity used. What's more, customers can be convinced of the Sales Engineer's deep interest in doing a job well.

Graphical Determination of Heat Transfer Film Coefficient for Ammonia Vapor

B. F. RABER* and F. W. HUTCHINSON**

THIS article is the twelfth in a series on heat transfer coefficients of refrigerants. The first article was published in the December, 1944, issue of HEATING AND VENTILATING and subsequent articles have appeared at intervals since then. The graphical solutions presented in this installment are for non-condensing ammonia vapor inside (Fig. 23) and outside (Fig. 24) vertical or horizontal pipes. These solutions complement the two earlier graphs[1] which have been presented for ammonia in liquid form. The principal difference between the solutions for liquid ammonia and the solutions, given here, for ammonia vapor is that the latter graphs use weight velocity, rather than fluid velocity, as required basic data; this change is necessitated because of the wide range of variation of vapor density as a function of pressure. The weight density is, however, a very simple term to evaluate since it is equal to the product of fluid velocity (expressed in feet per second) by fluid density (in units of pounds per cubic foot); values of the density can be readily obtained as the inverse of specific volume as given in standard tables of thermodynamic properties of refrigerants or from pressure-enthalpy diagrams for refrigerants.

Film coefficients for refrigerants in vapor form are useful in calculating the degree of superheat picked up in piping connecting the evaporator with the compressor and also in calculations for the extent of desuperheating effect in piping between the compressor discharge and the condenser. Where highly superheated vapor is supplied to the condenser, design of transfer surfaces within the condenser itself will require consideration of the preliminary section in which the transfer is from dry gas (superheated vapor) rather than from the condensing vapor. Since the film coefficient for cooling of superheated vapor is only a small fraction of that for condensing vapor it follows that failure to take account of the added condenser surface required in the desuperheating section may be responsible for a substantial increase in the condenser pressure (resulting from the necessity of maintaining an average condenser-cooling-water temperature difference greatly in excess of the design value). Thus engineering consideration of the film coefficient for desuperheating is essential to maintenance of reasonable operating economy.

From the standpoint of piping insulation, accurate knowledge of the vapor film coefficient is also important, since only in terms of the known overall coefficient of heat transfer can the optimum economic thickness of insulation be established. In this connection attention is directed to the fact that refrigerant line velocities are usually designed in terms of an arbitrarily selected pressure drop which, economically speaking, is fixed in terms of the increased compression energy requirements associated with lowered suction pressure; if consideration were also given to the reduced heat transfer rate associated with lowered line velocity it is very probable that the optimum size of piping between evaporator and compressor would be increased and the thickness of insulation decreased.

Fig. 23 is for turbulent flow of superheated ammonia vapor within a pipe whereas Fig. 24 is for flow of such vapor outside and normal to a single pipe. Fig. 23 is valid for all ammonia vapor pressures lower than 50 lb per sq in. abs, but for 100 lb per sq in. abs it is not valid if the density of the vapor is less than 1.5 lb per cu ft and for 150 lb per sq in. abs it is invalid for vapor densities less than 2.0 lb per cu ft. Fig. 24 is for turbulent flow and is valid for all weight velocities in excess of 1 lb per (sec) (sq ft); for lower values investigate the Reynolds turbulence criterion.

Example: A refrigeration compressor discharges ammonia vapor at a pressure corresponding to a saturation temperature of 79F and with 71F of superheat. The pipe has an inside diameter of 1¼ in. and flow occurs at a fluid velocity of 43.2 fps (velocities up to 50 fps are satisfactory for inside film coefficient of heat transfer based on such service). Determine the vapor conditions at the point of compressor discharge.

Solution: Going to any standard table or chart of thermodynamic properties of ammonia vapor one finds that the saturation pressure corresponding to a saturation temperature of 79F is 150 lb per sq in. abs. The actual temperature of the vapor from the condenser is $71 + 79 = 150$F and at a state of 150 lb per sq in. abs and 150F the specific volume is read as 2.4 cu ft per lb so the weight density must be the inverse of this or .417 lb per cu ft. The weight velocity in the discharge is therefore $43.2 \times .417 = 18$.

Now enter Fig. 23 at the known weight velocity of 18 (refer to dotted example line on the figure) and rise to intersection with the horizontal line for 1¼-in. inside diameter. From here follow the sloping directrix lines up to the heat transfer scale, then rise vertically to intersection with the horizontal line marked 150F. From this intersection move down parallel to the sloping directrix lines to intersect the heat transfer at a value of 65, the inside film coefficient.

Fig. 24 is used in exactly the same manner as Fig. 23, but with outside diameter instead of inside and weight velocity based on flow across and normal to the single pipe or tube.

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[1]Graphical Determination of Heat Transfer Film Coefficient for Ammonia, HEATING AND VENTILATING, January 1945.

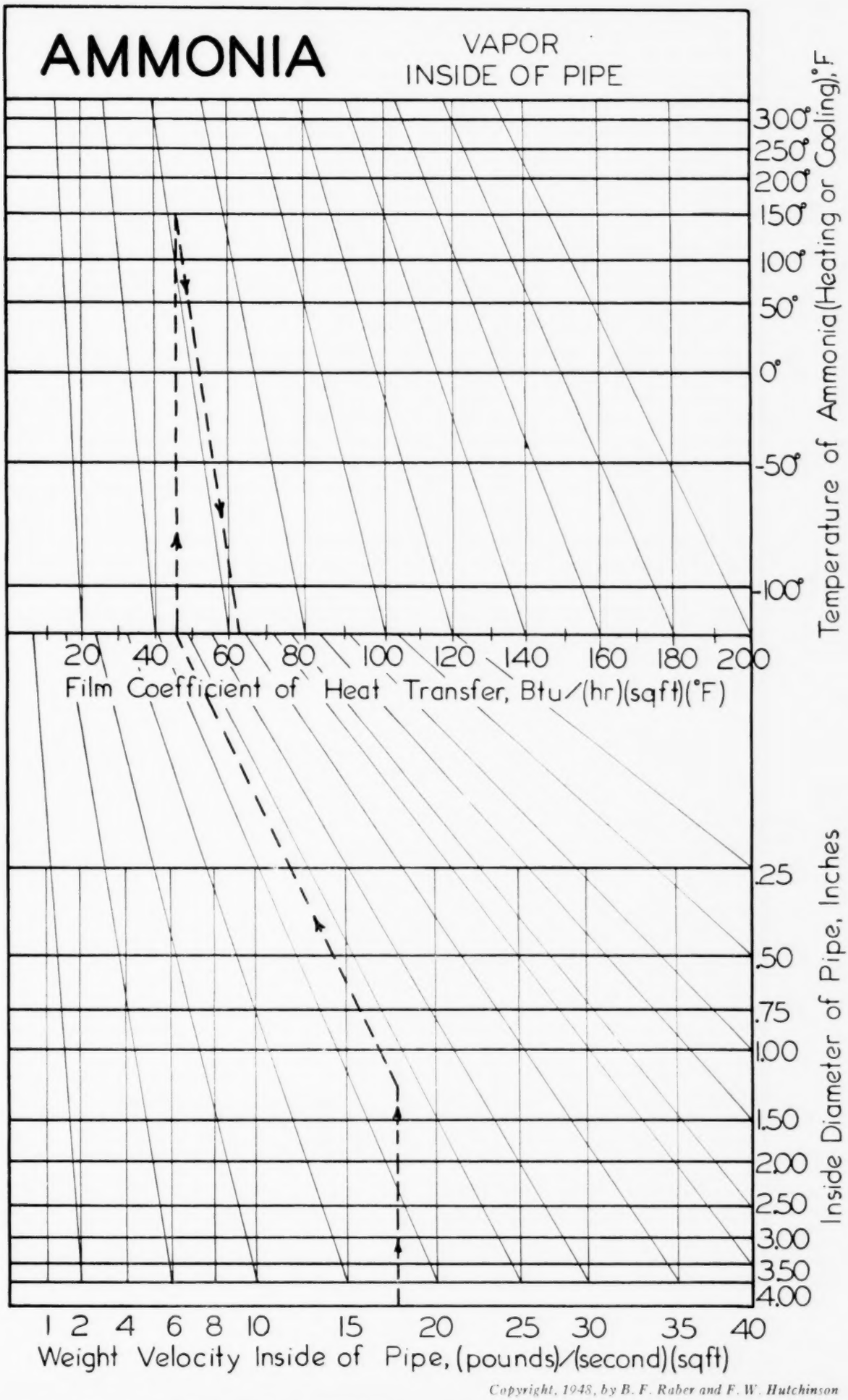

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Fig. 23. Film coefficient for ammonia vapor flowing inside a pipe.

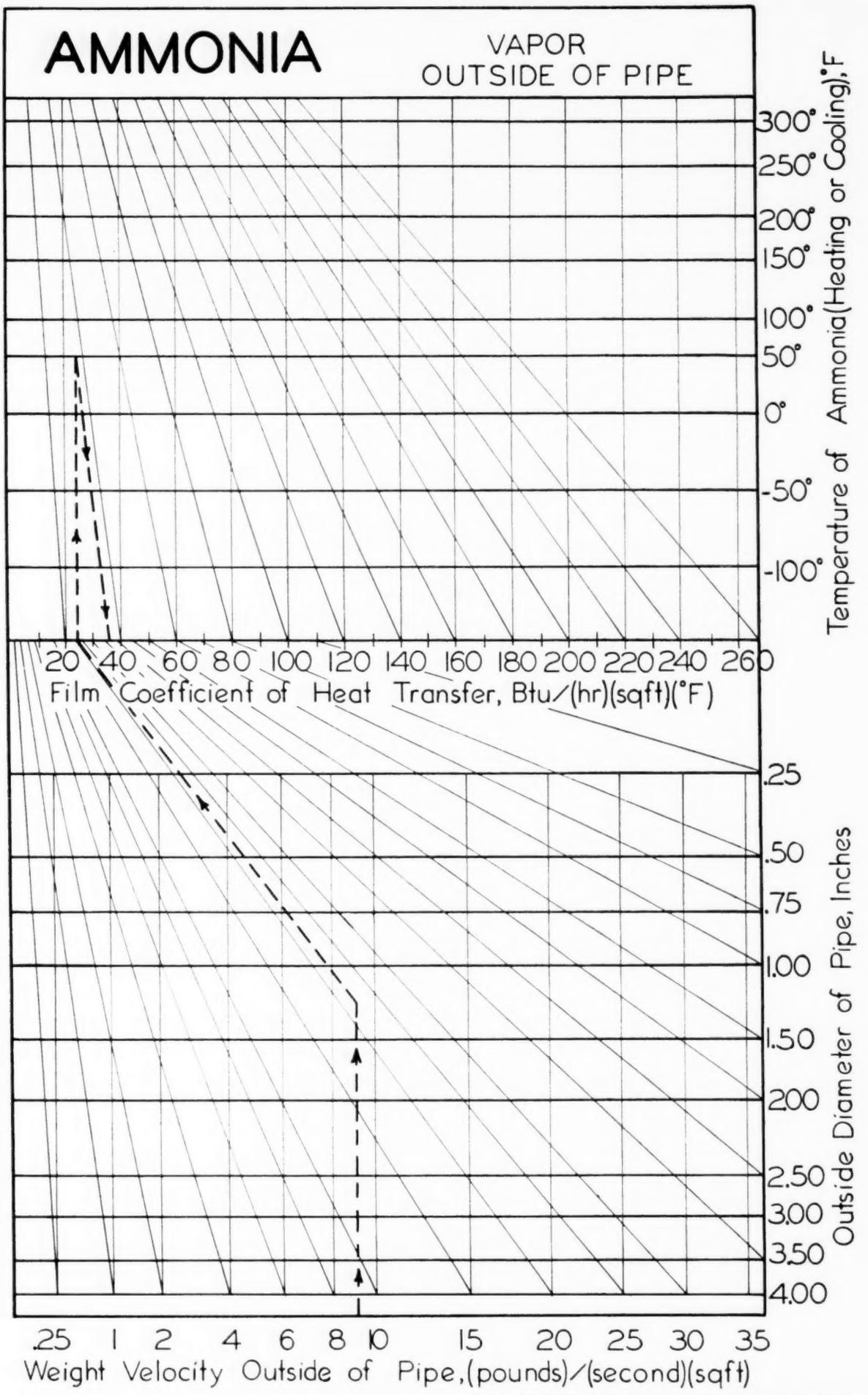

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Fig. 24. Film coefficient for ammonia vapor flowing outside a pipe.

Experience is my Classroom

By T. W. REYNOLDS

THE INQUIRING MIND

Most of us are reluctant to ask questions, fearing to expose an ignorance of which, however, the other fellow is probably already aware. The more questions you ask, the more you seemingly expose your ignorance, but the more you learn until some day you are less ignorant, though still ignorant, for we go to the grave ignorant.

Barron, one time editor of the *Wall Street Journal* is still remembered by some. With rooms at the old Waldorf-Astoria he interviewed many, asked questions innumerable and actually took short hand notes on his cuffs. When visiting his secretary, the writer being asked about this or that by Mr. Barron, would give an opinion worthless in itself, but one however that indicated his thinking. That was one kind of facts that Mr. Barron wanted to know, what a good cross section of the public was thinking.

The writer does not hesitate to ask questions when he does not know the answer, to ask them when he knows but wants confirmation or an associated idea, or when due to a hazy memory he has forgotten the answer and finds it less time consuming to ask someone for the information.

IN DEFENSE OF JOB CHANGES

To my father the hills looked green far away, so my mother always said. He moved often, to the great delight of his son. So it was not strange that the writer in early life changed his job with the coming of each spring, gaining experience thereby, as well as confidence as he learned that the other fellow or office had no corner on knowledge.

The old sayings: "A rolling stone gathers no moss" and "Nothing ventured, nothing gained" contradict one another. Neither one is right, men have succeeded and men have failed by following either one of these sayings. Back in the "sticks" there are men who have stayed on, yet traveled far, and there are men who have left the old town to travel far and become equally as successful.

The writer has worked three times for one organization, always coming back for new duties or more money than before, for it is easier to take on new men at the demand rate than to secure an authorization to raise the salary of those already employed. Familiarity does bring contempt; prestige is gathered elsewhere; a man is without honor in his own office.

The writer has left a few places which appeared in a rut and hopeless, yet changes surely came in time. Overnight there were radical developments, the place took on new life, and there were opportunities equally as good as the next place. So the writer does not know all the answers, though he does believe that as long as success is measured solely by acquisition of the almighty dollar, the man who waits around to fill a dead man's shoes, will be generally more successful in the long run. He will have a steady job, but most probably will work in a routine of monotony and become helpless if he ever lost that job. Whichever course is best in life, depends upon the nature of the individual and his contentment with that course.

Logically, the man who stays on knows the place best, yet if he stagnates there in thought and action he is never as good as the returning prodigal who brings back experience and a breadth of mind that increases the tempo of the place.

In the final analysis, if an organization has a large turnover in employment, it is the fault of the place. There is too much of regimentation and dullness for the majority of those employed. All the life, action and interesting things are vested in but a few at the top. What an organization needs is more men of average ability rather than a few men of brillancy at the top, and a balance of help who are regarded only as so many machines.

PROPERLY INSULATING THE DUCT

One can easily determine the kind and thickness of duct insulation for a given condition. How to apply that insulation, so as to maintain its insulating qualities and leave no projecting attachments, is a more difficult question.

Some coverers use a good adhesive at proper intervals all around the duct with special attention to the bottom of the duct where the most difficulty of holding is encountered. Others use wire to hold the covering until the adhesive sets. Adhesive in itself, however, is not a good insurance as to permanency of bond between insulation and duct. Moreover, wire drawn sufficiently tight tends to shear the insulating material, depending upon the kind of insulation used. For example, 1 in. thick asbestos cell board with $\frac{1}{4}$ in. corrugations, through a rigid board, has an exceedingly low density and would be damaged by the pressure applied.

A better job when using asbestos cell board is to cut the board to fit in one piece the width of duct face to which it is applied and then to secure it by steel bands $\frac{3}{4}$ in. x .015 in. thick. These bands should be drawn up tightly by means of a suitable banding machine and spaced not over 12 in. apart on the straight runs. They should be spaced more often on curved surfaces, say at least one band to each block of 6 in. width or less.

The bands give a neat looking appearance to the work and are superior to wire due to their width allowing them to be drawn much tighter without crushing the insulating material. This results in a better bond between the insulating material and the duct.

When the air cell board has been securely banded in place and all edges evened up, a strip of 16 lb asbestos paper 6 in. wide should be neatly applied and bent over each edge of the duct. This paper should be so pasted in place that 3 in. of material will extend along each face at the outside edges. The same material, but in a width of 3 in., should be applied over all other seams and joints. The spots where the bands cut into the board at the edges of the ducts should be filled up with asbestos cement. Open joints should be similarly filled up and covered over with a strip of the asbestos paper.

When the ducts are over 36 in. in width the banding is not sufficient in itself. In such cases, the bands are sometimes held in place, particularly on the bottom of the duct, by means of metal screws and washers as placed

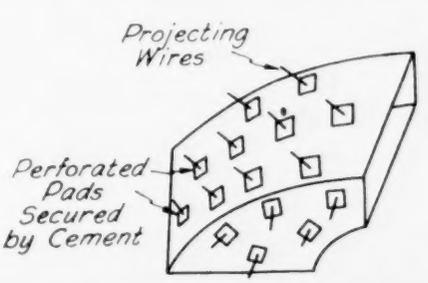


Fig. 1. Hangers for holding insulation.

over the bands after these have been drawn up in place. The only trouble with this method is that with wide ducts it leaves a multitude of projecting screws in a staggered arrangement inside of the ducts. These projections are objectionable as they are lint and dust collectors, offer resistance to air flow, and prevent a hazard to head and knees. Time and discomfort are required to clean the ducts, so that the wide ducts are seldom, if ever cleaned.

Return air and exhaust ducts in particular require cleaning, but there is no point in providing frequent access doors to these ducts if they have no proper access beyond the doors. Fastenings could be made by bolts or screws with projecting points outside, but this would require a man to work less comfortably inside of the ducts. A man would also be required outside of the ducts. The latter alternative would simply transfer the projections to the outside of the duct, the hazard of which can be appreciated by anyone who has ever had to climb around in a hung ceiling among a nest of ducts with little space between them. The projecting screws can, of course, be cut off by means of a bolt cutter. This, however, is hard labor and requires the use of a bolt cutter having removable jaws, for the jaws soon wear out.

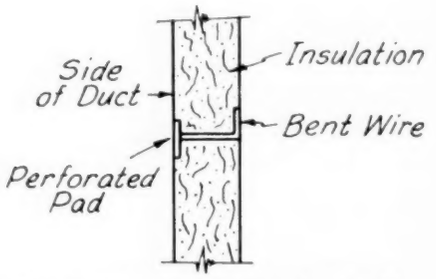


Fig. 2. How hangers are bent aside.

It might be possible to work from the inside of the duct using bolts or screws from the inside to taps into a piece of metal (say 1¼ in. square) on the outside. The bolt or screw would be caught in the hole. A better plan, however, is to eliminate the screws by substituting insulation hangers as shown in Fig. 1, retaining the banding method as heretofore described. Insulation hangers, as bought on the market, consist of a 4½ in. wire shank securely fastened to a perforated pad. These pads are cemented to the ducts on 12 to 18 in. centers, depending upon the size of duct and the pieces of insulation being applied. See Fig. 1. Manufacturers recommend that a drying time of 3 hours be allowed to bring about a rigid bond, though it is best to arrange the work so that the cement will be allowed to dry over night before applying the insulating material.

The wires stand at right angles to the duct surface to which they are applied, see Fig. 1, but when the bands have been drawn tight with the banding machine these wires are flattened against the bands. See Fig. 2. The insulation is then left in a finished state and there are no projections of any kind inside or outside of the ducts.

AWFULLY SIMPLE VS. SIMPLY AWFUL

Making a piping combination so interconnected and valved that anything can be done or routed by any path to fit any conceivable possibility, is one of those things that still tempts the creative abilities of the writer to this very day. Such combinations can be so condensed and colored on drawings that it is possible to understand them, but later on when met face to face in the field the writer has failed to recognize them or to understand them.

As for the operating engineer he never has occasion to use some of the combinations and in any event hasn't the time to trace out all of the possibilities during an emergency. Some combinations can only be learned by trial and error and some have been made so wierd that the results obtained were equally as weird. The chances of doing the wrong thing are multiplied the more involved the arrangement becomes.

There isn't a fixture or what not in the writer's home that hasn't a valve, yet none of these was used in the lone emergency that finally arose. The hot water tank had sprung a leak which rained on the oil burner below. A valve was just above, but the dear lady of the house all alone fluttered about the various valves (with ever increasing confusion and hesitation as more and more were found), until she finally ran into the street where a neighbor closed the street valve on the water main. A lot of water had gone over the dam by that time.

Some things, of course, have to be complex or rather confused, because in the main they are concealed. We had funny experiences back in the boom days on the construction of large New York hotels where many pipes were run in pipe shafts with outlets at each floor.

Work was all completed before it was discovered that hot water was piped to the drinking fountains and refrigerated water to the toilet bowls. One contractor told the writer that he saved a lot of labor by making the supply to each radiator ¾-inch and the return ½-inch where the runouts were run on the ceiling below. One could not very well reverse a radiator through error where this method was followed.

An automatic control system is another one of those things which can be over developed to where too much control gives no control. An elaborate control system will work satisfactorily as long as it is serviced by the manufacturer, but once turned over to the owner it is apt to become inoperative or improperly adjusted. It seems only a matter of time before the system will degenerate to such a condition that it is more or less abandoned to practically manual control. The results in the end are not so good as would have been had the controls been of a more simple nature.

SOOTABLE OR SUITABLE

Complaints had been received from two home owners of oil burners. One we will designate as *A*, the other as *B*. Now *A* had taken a dislike to the soot in the boiler flue ways, whereas *B*, strangely enough, liked more soot in the flues of his boiler.

Considering *A* first, an inspection disclosed a black carbon film in the secondary passes of the boiler, though there was no trace of this within the combustion chamber or upon the primary heating surfaces. There was really nothing there that he should worry about, since this film of carbon is in reality due to the heavy ends of the No. 3 oil which he was burning. These heavy ends, which represent only a very minute portion of the fuel used, require temperatures much in excess of what is ordinarily generated in domestic heating for their complete and absolutely clean combustion.

It is true, of course, that had he used lighter oils, the condition complained of would not have prevailed to the same extent, but the point is that regardless of the quality of the fuel, it is practically impossible to have boiler surfaces remain absolutely clean. Even with gas fuel there is a certain amount of soot. We are all quite familar with the carbon condition that accumulates in the automobile gasoline engine, even though it uses a fuel as volatile as gasoline.

So much for owner *A*. As for *B*, an inspection showed too much soot, yet he had thought that he needed more. He got out an old text-book to prove that lampblack was a great radiator of heat, therefore was of great advantage to the heating surfaces of the boiler.

Books being the order of the day, the trouble hunter hopefully thumbed the pages of that book over and found what he wanted. Therein it was stated that dead or confined air is a good non-conductor of heat and it was further explained by the inspector that there are minute air cells among the sooty particles. Soot, he was also told, would make an excellent covering for steam pipes, if it could be practically applied.

Incidents such as the one given last appear dubious, but truth is stranger than fiction. It is just such occurrences as related that make the engineer feel his education was not wasted after all.

EXPERIENCES IN TROUBLE-SHOOTING

In our first acquaintance with books, we gravitate to those which deal only in mystery. Such books might fire our imagination and tend to make us reason out the answer, if it were not for the fact that the book has the answer ahead of us. So hurriedly we turn to the next page and soon become mentally lazy. The book thinks for us. There is no allure in simple thinking, in reasoning back from effect to one of several causes possible by the tedious process of elimination.

One goes out on the trouble job to find the owner, architect, engineer, builder, heating contractor, jobber and salesman all waiting for you to arrive, all huddled in overcoats around a half assembled boiler in the cellar. The cellar is dark, damp and cold. You avoid the many objects lying around, advance as the personification of all wisdom. Courtesies out of the way, it is every man for himself, you are on your own and the crowd dares you to find the solution to the problem before them. They have all tried without avail, and proclaim that at last they, and you for that matter, have met something which cannot be accounted for. It is all such a mystery.

Case 1. The steamfitter can't get the boiler sections together. They are all numbered for sequence in assembly and there are graphic and printed instructions which he has disdainfully thrown away as unnecessary with his background of experience. You might as well get it over with; it is hard to do so diplomatically, but you venture the opinion that the boiler could be wrongly assembled, in fact as you grow bolder in the immediate silence which follows, you say you know it is put together mostly backwards.

The steamfitter throws down his wrench, his helpers glare you down. He has been putting boilers of this manufacturer together for years and knows his way around. You imply that the manufacturer has several types of boilers and has made several changes in each type as the years go by, so the steamfitter challenges you to get the boiler sections together. You tell him you can't do this as the boiler now stands, nor can anyone else, but for him to take it apart and that it will then go together again, providing he follows your instructions.

It is so easy to cock the nipples which join the sections of a boiler, especially so when the sections are heavier than you have previously experienced and you have not the required patience. This had been done in the case in mind. Needless to say the sections once apart went together without trouble.

Sometimes a boiler assembly is really difficult where only new sections are added. The old ones warp a bit while the new ones are perfect. Nevertheless, they can be put together by means of jacks, but let us hope that the boiler never again has to be taken apart. It is next to impossible then.

Case 2. Shifting the scene now to an oil-fired boiler which does not heat the job, you find an addition to the usual crowd in the person of the oil burner salesman. If he wants to get the thing over quickly, the oil burner salesman may present a lot of imposing data on boiler ratings, heating surface and grate area, all to prove the boiler inadequate. This makes a hit with the crowd, they nod their heads affirmatively, even though ordinary judgment on the mammoth size of the boiler should make it apparent that something other than the boiler is wrong.

You could counter attack by questioning the ability of the burner, or the interpretation of the data presented, but this leads to endless argument and is unnecessary. You make a mental note to talk to his employer later on about co-operation and needless strife.

Meanwhile, you open the firing door and look within, one of the first things you usually do, regardless of the nature of the complaint. Sure enough, as suspected and as sometimes happens, the uptake section has been installed near the front of the boiler rather than at the rear where it is supposed to be. Obviously, the boiler cannot perform if the gases are bypassing most of the water backed surfaces on their way out to the chimney. You now have your reward, button up your overcoat and go on your way to other mysteries. It's all in a day's work.

Case 3. The boiler salesman is waiting outside in a car to take you to the next problem. On the way he describes quite accurately a condition indicating a foaming boiler and says, "Now don't tell me that this particular boiler is foaming, it has been cleaned out ever so many times." You tell him that perhaps it was cleaned out after erection before the dirt and grease had a chance to fully return from the heating system. You further say that cleaning out involves more than mere draining off; a good fire and a good cleanser is needed, together with the proper method.

When you get there, you open the safety valve and it spouts water, a clear indication of water being thrown over. So the boiler is again cleaned out and soon there is a steady water line. You say there will be trouble again in about a week, to repeat the cleaning then and even once more if required.

The salesman says that he is suspicious of his competitor, that he must have visited the job during erection and thrown a bar of soap in the works. You have heard this story before and say nothing, having found more than one bar of soap and towel hid in boiler sections back in the factory. They are put there by workmen who want to clean up ahead of the whistle and are forgotten, or possibly the soap accidentally falls down to a point in the boiler section from where it cannot be easily retrieved.

THREE MYSTERIES

A knock in an air compressor is something that must be taken care of, but it is often an elusive thing to locate. A compressor in a railroad boiler house was taken apart a couple of times by expert workmen, but the knock complained of was still to be heard. Meanwhile, the writer, wondering why the knock seemed most pronounced in an air receiver 100 ft or more away from the compressor, suggested that the manhole on the receiver be opened for inspection. In reply, he was told that the knock merely telephoned along to the receiver. Just the same, the writer took a chance on being laughed at and ordered the manhole opened.

Inside was found a short piece of 2 x 4 in. timber which had fallen in during construction, the job being a new one. With each pulsation of the compressor this bit of wood was pulsating in rhythm and might have worn itself out in time had its pounding not first worn out the nerves of the operating engineer.

Not long after the foregoing event, the writer removed to construction work at the General Electric Co. Erie Works. We had just overhauled a second-hand yard locomotive. Put to work, one steam cylinder started to make so much noise its whistle wasn't needed to indicate the approach of the locomotive.

The writer thought back to the block of wood in the air receiver. So things were opened up. A center punch had been carelessly left behind by the last workman.

The writer recalls from trouble-shooting days a heating system that definitely was cold. Its location and the persons involved can't be told for various reasons. Two trouble shooters solved it while all alone one night. Feeling along the pipe from the boiler until they came to a cold spot, they debated a bit because a branch might go cold, but never before had they found a sharp line of demarcation between hot and cold in a pipe.

Getting down to real work, they shut off steam, opened up the pipe at the nearest flanges and looked within. There, about an arm's length in, was a pair of overalls, hidden at the close of the day by a steamfitter who went to the hospital that night and never returned.

Removing this obstruction and restoring things otherwise to their original condition, the two trouble hunters never would tell how they cured the job, except to say that they had prayed long and hard to the Almighty.

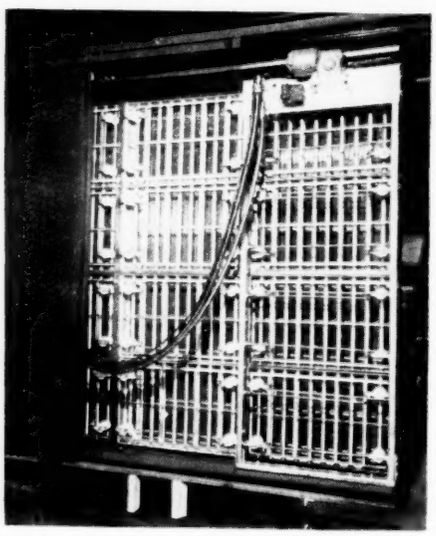
NEWS OF EQUIPMENT AND MATERIALS

Included in the following pages of this department are descriptions of new equipment exhibited for the first time at the 5th All-Industry Refrigeration and Air Conditioning Show held at Cleveland or the 8th International Heating, Ventilating and Air Conditioning Exposition in New York City, and not previously described in previous issues of Heating and Ventilating.

Washer for Precipitator

NAME — Automatic washer for Raytheon precipitator.

PURPOSE—Automatic washing and drying of ionizer and collector plates.



FEATURES—Unit washes and dries all ionizer and collector plates, reapplies the adhesive and gets unit ready for service. It is only necessary to throw a switch and the unit goes through a complete washing and oiling cycle from tier to tier without a shutdown period. Aluminum is used throughout the construction. Plumbing is copper tubing with sweated joints. A full cone, self-cleaning brass nozzle provides full coverage of all surfaces to be washed. Except for the drive assembly which moves the washer in a horizontal direction, the unit contains no moving parts. Drive assembly is suspended from gear tracks at the top of unit and away from all water contact or dirt that might cause clogging. Washer units are suspended front and rear from framework. Control box can be mounted in any desired location.

MADE BY—*Raytheon Manufacturing Co., Waltham 54, Mass.* 27

Exhibited at New York Show

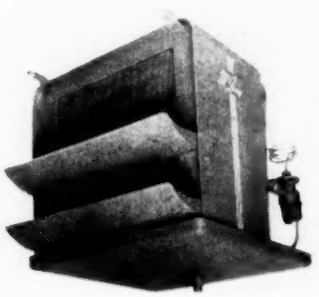
Unit Cooler

NAME—Pacemaker unit cooler.

PURPOSE—For air conditioning and room cooling.

FEATURES—Heavy gage rust resisting steel is used in constructing the unit. Tinned copper tubes are hydraulically expanded for contact with rippled aluminum fins for heat transfer efficiency. The resulting corrugated inner tube surface, makers claim, creates clean, refrigerant turbulence for increased refrigerating effect. Units are designed and rated in accordance with proposed REMA commercial standards codes. Cooler is designed for all normal purpose applications above 35F room temperatures.

SIZES AND CAPACITIES—Ten models available ranging in capacity from 90 through 1,900 Btu per hr per degree temperature difference. Line includes one twin fan model and two representative single fan models.



MADE BY — *McQuay, Inc., 1600 Broadway N. E., Minneapolis 13, Minn.* 28

Exhibited at Cleveland Show

Room Cooler

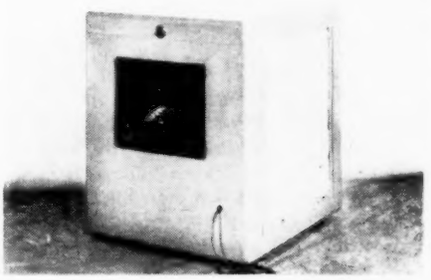
NAME — Climax evaporative type home cooler.

PURPOSE—Cooling unit for homes, stores and offices.

FEATURES—The motor and dynamically-balanced blower wheel are mounted in rubber to insure quiet operation. Double-acting evaporator pads cool by evaporation and filter out pollen and dust. Only enough water is used to keep pads moist. Heavy steel plate construction used.

SIZES AND CAPACITIES—Three sizes ranging from 1500 cfm to 3200 cfm.

MADE BY—*Climax Machinery Co., 301 So. LaSalle St., Indianapolis 1, Ind.*.....29



Exhibited at New York Show

Kitchen Ventilator

NAME — Sprouse built-in-wall kitchen ventilator.

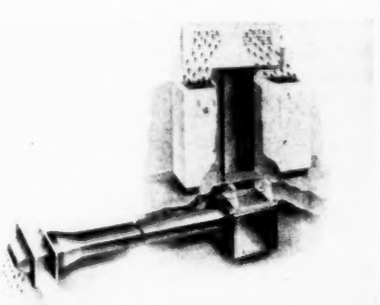
PURPOSE—General kitchen ventilation.

FEATURES — Air is drawn through grille or hood placed over the kitchen range. Power unit, which is placed in the basement, contains the motor and blower wheel in a square metal frame. Rectangular duct connects grille to exhaust outlet. Fan exhausts air through outlet in cellar walls. Filter keeps cooking fats out of the power unit.

LITERATURE AVAILABLE—Illustrated folder.

MADE BY—*V. E. Sprouse Co., Inc., Columbus, Ind.* 30

Exhibited at New York Show

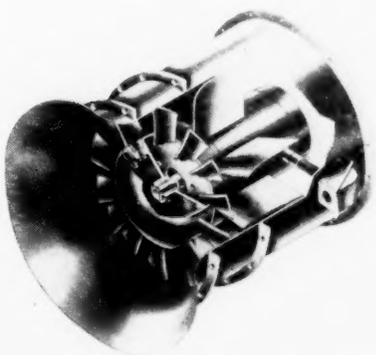


Adjustable Blade Fan

NAME—Axivane adjustable blade fan.

PURPOSE—To provide a wide pressure range or a change in volume of air for ventilation work.

FEATURES—Blade setting can be rapidly changed by loosening a



lock nut and setting the blades uniformly with the indicator and retightening the lock nut. A stop prevents setting blades in a position likely to overload the motor. By constructing the fan around the motor, manufacturers claim space reduction and power saving.

SIZES AND CAPACITIES — Available in 124 models with hub diameters varying from 14 to 26½ in. and speeds from 860 to 2450 rpm.

LITERATURE AVAILABLE—Illustrated catalog.

MADE BY—*Joy Manufacturing Co., Pittsburgh 22, Pa.* 31

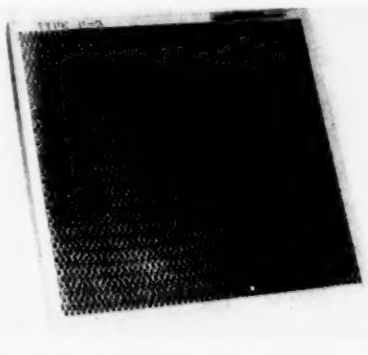
Exhibited at New York Show

Air Filter

NAME — Air-Maze P-5 air filter panel.

PURPOSE—Air cleaning.

FEATURES—Makers claim that this type unit is adapted to installations where no space exists for plenum



chambers in front of coils, or where V or U-type filter banks are not practicable. Panel consists of alternating layers of Z-shaped channels. Both faces of filter are protected by expanded metal to form a rigid unit and to facilitate handling. Where panel is in contact with salt air, bronze media and frame construction can be supplied. When dirty, filter is cleaned by flushing with a commercial solvent and hot water, dried thoroughly, and coated with an adhesive.

SIZES AND CAPACITIES — Available in any rectangular size up to 30 x 30 in.; 2 in. thickness is standard and 4 in. thickness is available for special applications.

MADE BY—*Air-Maze Corp., 5200 Harvard Ave., Cleveland 5.* 32

Exhibited at New York Show

Warm Air Furnace

NAME—Vikimatic winter air conditioner.

PURPOSE—Warm air space heating through burning of fuel oil.

FEATURES—Fuel oil vaporizing bur-

ner is used. Burner has forced draft on high and low fire with a method of equalizing the air to the burner and controlling burner surface temperature. Blower in the base of the unit is mounted with outlet at an angle for better air direction. Blower is mounted on felt to prevent vibration. Entire blower assembly can be removed through the cabinet opening without disturbing the furnace of blower unit.

SIZES AND CAPACITIES—72,000 Btu at bonnet.

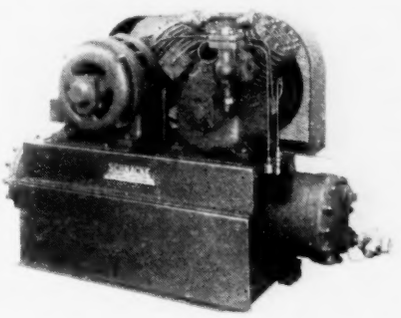
MADE BY—*The Viking Manufacturing Corp., 1747 Chester Ave., Cleveland, Ohio.* 33

Exhibited at New York Show

Condensing Unit

NAME—Schnacke Model FC condensing unit.

PURPOSE—Combined compressor and condensing unit for air conditioning and refrigeration work.



FEATURES—Four cylinder compressor is designed for use with Freon 12 or methyl chloride refrigerant. Condenser is of the cleanable type using Wolverine finned tubing. Unit consists of heavy duty compressor, standard motor pulley and flywheel drive, motor and belt adjustment facilities, shell and fin tube condenser, high and low presure controls, and water control valve.

SIZES AND CAPACITIES—10 to 25 hp.

MADE BY— *Schnacke, Inc., Evansville, Ind.* 34

Exhibited at Cleveland Show

Leak Detector

NAME—Justrite leak detector.

PURPOSE—For detecting leaks in refrigeration system.

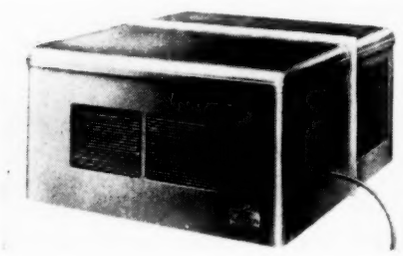
FEATURES—Handle enclosing the fuel tube is constructed of Bakelite. The brass burner tube accommodates the removable flexible metal leak detector hose. The only moving part on torch is the regulating valve knob. Detector burns between 20 and 45 min on 1½ oz of fuel.

MADE BY—*Justrite Manufacturing Co., 2061 N. Southport Ave., Chicago, Ill.* 35

Air Conditioner

NAME—Frigidaire room air conditioner.

PURPOSE—For reducing room temperature.



FEATURES — Mechanisms and controls are housed in a welded steel cabinet, bonderized as protection against rusting. Top can be removed for inspection or replacement of filter. Aluminum fin coils are used for heat transfer and Freon-12 is the refrigerant. A 1/10 hp motor provides power for the conditioned air fan and the condenser fan. Unit has 3-position switch so that air can be cooled, circulated and ventilated without being cooled; or can serve without mechanism operating. Fresh air controls admit up to 35 cfm for ventilation. Unit is powered by the Frigidaire Meter-Miser of ½ hp. Metal adapter plates permit tight installations in windows up to 52 in. wide.

MADE BY—*Frigidaire Div., General Motors Corp., Dayton, Ohio.* **36**

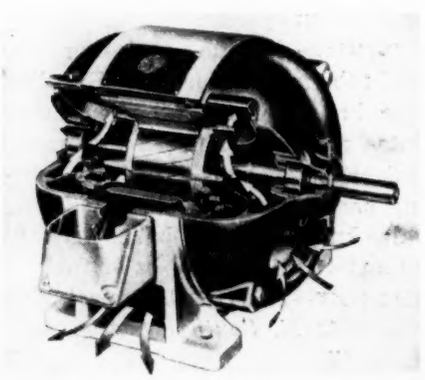
Exhibited at Cleveland Show

Motor

NAME — Permamotor polyphase squirrel cage induction motor.

PURPOSE — For general motor service.

FEATURES—Motor is available in frames 203-326 with NEMA mounting dimensions. Easy accessibility is provided for fittings and servicing. Unit is protected against dripping moisture, liquids and dust. Oversize, double-shielded ball bearings are used permitting shaft extension from either or both ends of motor as desired. The one-piece die cast rotor has ventilating fans cast integrally to end-rings. Spun aluminum deflector directs cooling air to the stator coils with cool air pulled into motor by rotor fan blades.



LITERATURE AVAILABLE — Bulletin No. 1201.

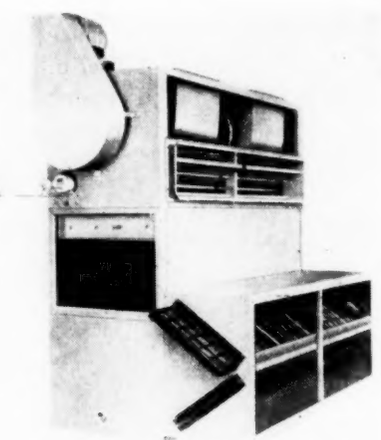
MADE BY—*A. O. Smith Electrical Manufacturing Co., New York 17, N. Y.* **37**

Exhibited at Cleveland Show

Air Conditioner

NAME — Frigidaire central system air conditioner.

PURPOSE—For general air cooling where a central type system is required.



FEATURES — Motor is mounted in rubber on a two-way adjustable base for ease in aligning and belt tightening. Filters are 2 in. thick of the throw-away type. Multi-blade forward curve fans operate at slow speeds. Fan section may be installed to discharge conditioned air in various directions. Metered refrigerant flow through special distribution header provides equal distribution of refrigerant. A staggered tube system speeds heat transfer by creating turbulence and providing a wiping action of air flowing over the tube and fin surfaces.

SIZES AND CAPACITIES—5 to 45 tons refrigeration and air quantities from 2,400 to 9,000 cfm.

LITERATURE AVAILABLE—Illustrated folder.

MADE BY—*Frigidaire Div., General Motors Corp., Dayton, Ohio.* **38**

Exhibited at Cleveland Show

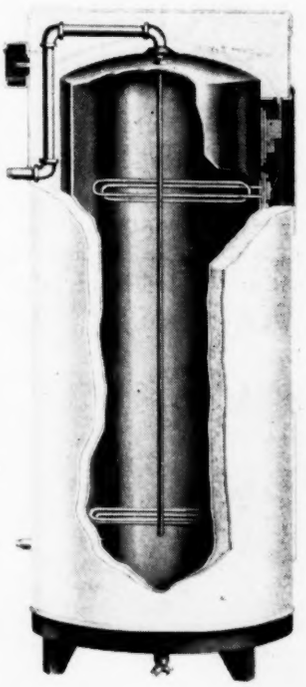
Water Heater

NAME—Lochinvar automatic electric water heater.

PURPOSE—For heating water by electric means.

FEATURES — Hot water outlet is located at the top of the tank and then drops down inside the casing to form a heat trap. Heating elements are of the immersion type, mounted in the tank and sealed with a gasket between the element and the tank. Each heating element is equipped with a thermostat which operates automatically. Cold water inlet at the bottom of the tank is provided with a baffle to diffuse the flow of incoming water. Magnesium anodes can be supplied as optional extra equipment.

MADE BY—*Michigan Tank & Furnace Corp., Dearborn, Mich.* **39**

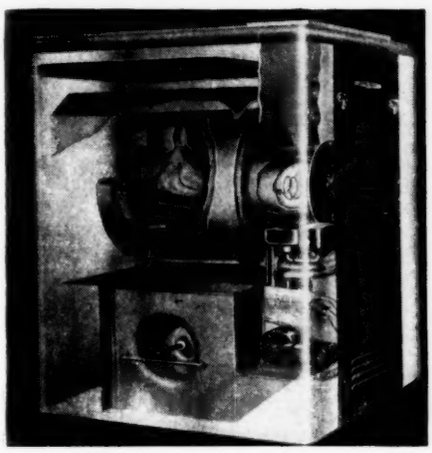


Warm Air Furnace

NAME—Norge oil burning winter air conditioner.

PURPOSE—Space heating.

FEATURES—Heat is drawn through a 17 ft spiral heat economizer by vacuum-draft. This draft pulls air



through the combustion chamber which it is claimed eliminates oil fumes from entering the house. Furnace has a stainless steel refractory.

SIZES AND CAPACITIES—Model 90B has a bonnet output of 90,000 Btu; model 120B, bonnet output of 120,000 Btu.

MADE BY—*Norge Heat, Division of Borg-Warner Corp., 574 E. Woodbridge St., Detroit 26, Mich.*.....**40**

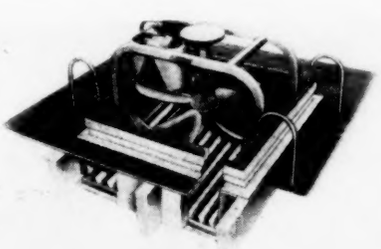
Exhibited at New York Show

Attic Fan

NAME—Chelsea attic fan.

PURPOSE—House cooling through the exhaust of attic air.

FEATURES—Fan is designed for attics of low head room. No vent box or temporary ceiling grille is required. A hole is cut through the ceiling to the attic to accommodate the spring mounted vertical discharge fan. Unit can be mounted on floor supports or by springs and sash chain from the rafter. Ceiling shutter opens when fan is turned on. Pull chain control switch can be operated upstairs or down through the stairwell. A fuse link will stop motor and close shutter when excessive air temperatures pass through the fan from below. Unit comes as a package unit with all the accessories for installation.



SIZES AND CAPACITIES—Three units of 6,000, 8,500 and 12,000 cfm.

MADE BY—*Chelsea Products, Inc., Grove and Olsen St., Irvington 11, New Jersey* **41**

Exhibited at New York Show

Oil Burner Motor

NAME — Brown flange mounted oil burner motor.

PURPOSE—Motor for use with oil burners.

FEATURES — Motor is totally enclosed, split phase, and operates at 1725 rpm. It is built with an Underwriters manual reset protector buttons, and operates on 110 volts, 60 cycle current.

SIZES AND CAPACITIES—$\frac{1}{8}$ to $\frac{1}{4}$ hp.

MADE BY—*Brown Electric Co., Forest Hills, N. Y.* **42**

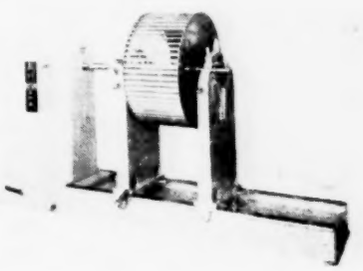
Exhibited at New York Show

Balancing Machine

NAME—Bear industrial dy-namic balancing machine, Model 375-R.

PURPOSE—For the dynamic balancing of rotating parts.

FEATURES—A method of roller adjustment permits the operator to change the machine set-up from 1 in. diameter shaft to a 5 in. diameter shaft in a few minutes. The towers can be moved along the bed of the machine through a medium of a rack and pinion. A Curtis double universal joint type drive is used and to this can be affixed either an adaptor or a three-jaw



self centering chuck. Controls and dial indicators are so mounted that the operator can control his work at the control tower regardless of the bed length.

SIZES AND CAPACITIES—For balancing parts from 5 to 2,000 lb.

MADE BY — *Bear Manufacturing Co., Rock Island, Ill.*.....**43**

Exhibited at New York Show

Coupling

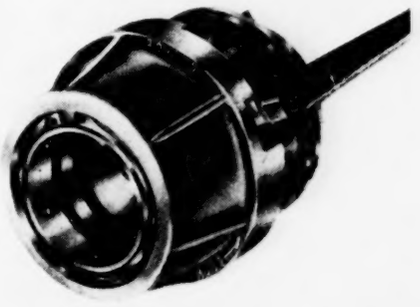
NAME—Roylyn trip-proof coupling.

PURPOSE—Coupling provided with a positive shut-off valve.

FEATURES—Valve is incorporated in coupling design so that the valve must be in the shut-off position before the coupling can be disconnected or broken. Piston type valve effects a seal even with static pressure. Coupling requires only a 40° rotation to activate it.

SIZES AND CAPACITIES — Available in 2½ in. pipe thread with larger units contemplated.

MADE BY—*Roylyn, Inc., 718 W. Wilson Ave., Glendale 3, Cal.* **44**

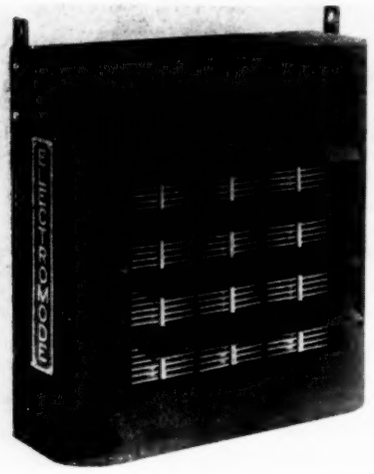


Unit Heater

NAME — Electromode suspension-type unit heater.

PURPOSE—Space heating.

FEATURES — Heat is furnished by patented safety-grid consisting of



a nichrome resistor wire surrounded by insulating powder inside a seamless sheath. There are no exposed hot wires, coils, or glowing elements. Thermostatic control makes it possible to hold room temperature within close limits.

SIZES AND CAPACITIES—From 10 to 60 kw with outputs from 34,150 to 204,900 Btu.

MADE BY—*Electromode Corporation, 45 Crouch Street, Rochester 3, N. Y.* 45

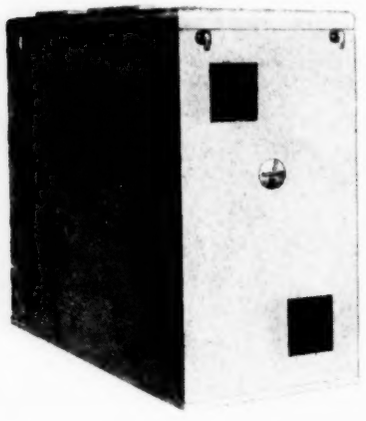
Exhibited at New York Show

Warm Air Heater

NAME—Niagara oil fired winter air conditioner.

PURPOSE—General space heating.

FEATURES—Pressure type oil burner uses No. 3 fuel oil. Unit has



belt and pulley driven blower, rubber mounted thermal protected motor, barometric draft regulator, and a precast insulating ceramic combustion chamber.

SIZES AND CAPACITY — Model 30-90AC, output 90,000 Btu at registers; Model 30-135, 135,000 Btu at registers.

MADE BY — *Niagara Furnace Division, The Forest City Foundries Co., 2500 W. 27th St., Cleveland 13, Ohio*.....46

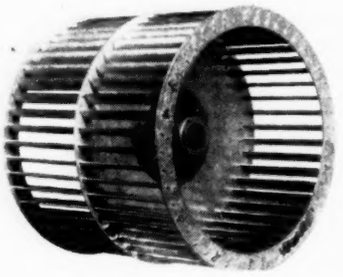
Exhibited at New York Show

Blower Wheel

NAME—Schwitzer-Cummins blower wheel.

PURPOSE—Blower wheel for use with air conditioning units and evaporative coolers.

FEATURES—Galvanizing process bonds all blades to a common center



disc as well as to the two outside rims. Makers claim unit is particularly adapted to high speed operations and for installations where a great deal of resistance has to be overcome.

MADE BY—*Schwitzer-Cummins Co., 1145 E. 22nd St., Indianapolis 7, Ind.*.....47

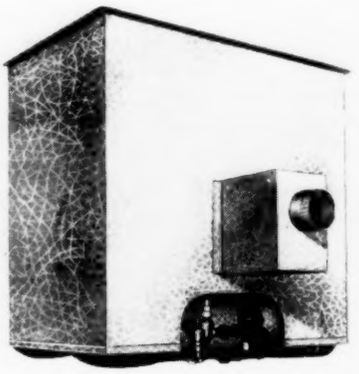
Exhibited at New York Show

Floor Furnace

NAME—Empire gas floor furnace.

PURPOSE—Space heating.

FEATURES—Vent connection is directly above a recessed housing at the bottom of one side of the outer casing. Housing accommodates all connections and controls with no protrusions. All connections are made on the same side in a small, accessible area. Furnace bottom is designed to protect entire burner assembly. Concave stampings are said to accelerate swirl of air through the furnace and to strengthen the outer casing. Air-cooled inner shell of unit maintains



a safe surface temperature on the combustion chamber at all times.

MADE BY—*Empire Stove Co., Belleville, Ill.* 48

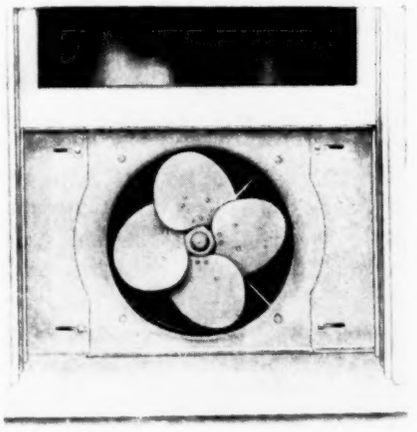
Exhibited at New York Show

Window Fan

NAME—Schwitzer-Cummins 24 in. window fan.

PURPOSE—Room ventilation.

FEATURES—Entire fan is weatherproofed and can be installed in an ordinary window frame. Motor is totally enclosed and floated in rubber for quiet operation. When installed in window, window can still be raised or lowered.



SIZES AND CAPACITIES—With a 1/6 hp motor, fan delivers 4,500 cfm.

MADE BY—*Schwitzer-Cummins Co., 1145 E. 22nd St., Indianapolis 7, Ind.*.....49

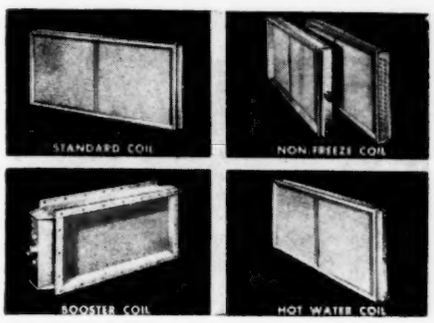
Exhibited at New York Show

Heating Coils

NAME—Modine heating coils.

PURPOSE—Coils to facilitate heat transfer.

FEATURES—Four new types of heating coils are available in standard,



non-freeze, booster and hot water. The standard, non-freeze, and hot water coils are available in the same casing sizes. Holes in the flanged casing edges have the same diameter and are aligned in the three types of coils. Absence of baffles or shielded headers within ducts is said to provide for low operating loss.

MADE BY—*Modine Manufacturing Co., Racine, Wis.* 50

Exhibited at New York Show

Condenser

NAME—Universal Cooler air cooled condenser.

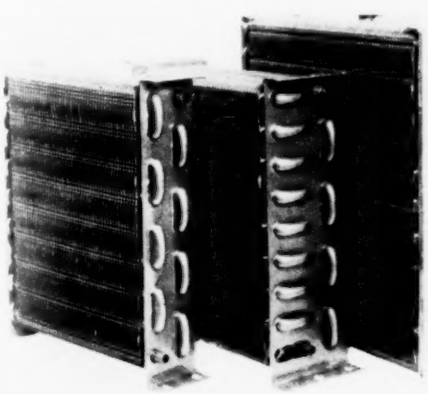
PURPOSE—Heat exchanger for condensing vapors.

FEATURES—Thin sheets of copper clad steel are die stamped so that they form not only fins for the condenser but also a short section of tubing. When layers of these stamped sheets are assembled and brazed a condenser results that is virtually of integral construction. As the fin and tube are made from a single piece of metal, better heat transfer results.

SIZES AND CAPACITIES—1/8 to 3 hp.

MADE BY — *Universal Cooler Division, International Detrola Corp., Marion, Ohio.* 51

Exhibited at Cleveland Show

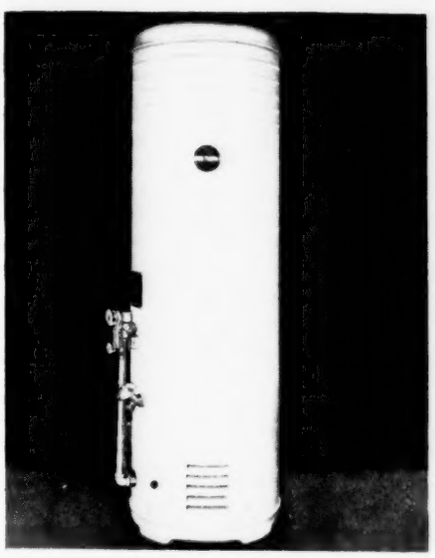


Water Heater

NAME — Duo-Therm gas water heater.

PURPOSE — For heating domestic water.

FEATURES—Large off-center burner is said to prevent condensation drips directly on burner and to increase the heat travel. A heat chamber base is shaped to meter



secondary air to all ports of the burner. Boiler is built of heavy gage steel with hot dipped zinc lining. Flow of gas to burner is controlled by a Grayson-Robertshaw unitrol. Spun glass insulation is used throughout.

MADE BY—*Duo-Therm, Division of Motor Wheel Corp., Lansing 3, Mich.*.....52

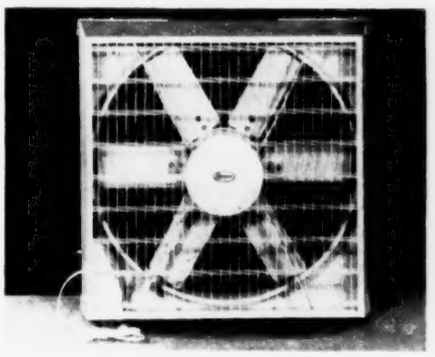
Exhibited at New York Show

Ventilator

NAME—Sprouse window ventilator.

PURPOSE—Room ventilation.

FEATURES—Unit is designed to place in window and is provided with brackets to fit the window frame. Ventilator fits windows from 27 to 37 in. wide. The 1/6 hp, 1500 volt a.c. motor develops 625 rpm at low speed and 650 rpm at high speed. It is rated to deliver



3000 cfm at low speed and 4200 cfm at high speed.

MADE BY—*V. E. Sprouse Co., Inc., Columbus, Indiana.* 53

Exhibited at New York Show

Condensate Return

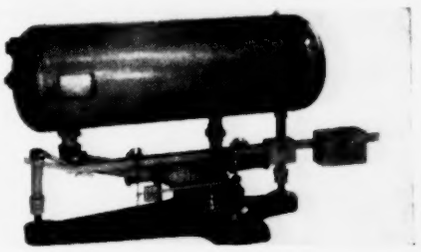
NAME — Acker condensate return system.

PURPOSE — Condensate return system to provide constant flow of steam and rapid return of high temperature condensate to boiler.

FEATURES — Individual traps on steam operated equipment are eliminated. Condensate is accumulated by gravity and is returned to the boilers at temperatures ranging up to 350F. All water fed to the boiler through this system is deaerated by liberation of free oxygen and non-condensable gases. Application can be made to handle condensate and make-up water in single and multiple for larger requirements. No pumps are required.

SIZES AND CAPACITIES—For boilers from 10 hp and larger and for steam pressures up to 250 lb.

MADE BY—*W. M. Acker Organization, 3167 Fulton Rd., Cleveland, Ohio.*.....54

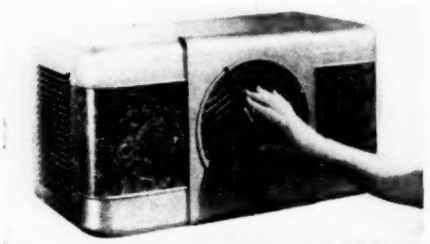


Room Conditioner

NAME—Fedders-Quigan room air conditioner.

PURPOSE—For cooling air temperatures of room.

FEATURES—Unit is provided with



a grille which permits cool air to be discharged at any desired angle. Although designed for installation on window sills, unit can be installed at any higher level such as transoms or high window. Units cool, dehumidify, filter, and distribute either outside air, room air, or any combination of the two. Makers claim that soundproof construction makes operation as quiet as with an electric fan.

SIZES AND CAPACITIES—½ and ¾ ton.

MADE BY—*Fedders-Quigan Corporation, Buffalo, N. Y.* **55**

Exhibited at Cleveland Show

Water Heater

NAME—Rheem Series 60-T table top electric storage water heater.

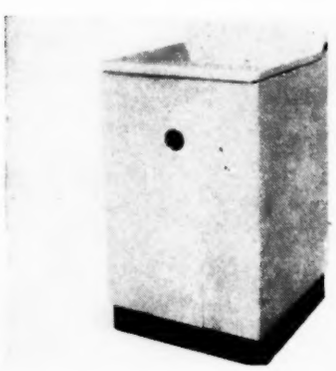
PURPOSE—To provide an electrically-operated water heater to fit in as a built-in unit in kitchens.

FEATURES—Unit is encased in a steel jacket and is recessed at the bottom to fit snugly over baseboard. Heating element is composed of nichrome imbedded in magnesium oxide and sealed in a seamless copper tube. Unit is insulated with fiberglas. Finger-tip control dials provide accurate water temperature regulation.

SIZES AND CAPACITIES—30 gal.

MADE BY—*Rheem Manufacturing Co., 570 Lexington Ave., New York, N. Y.* **56**

Exhibited at New York Show

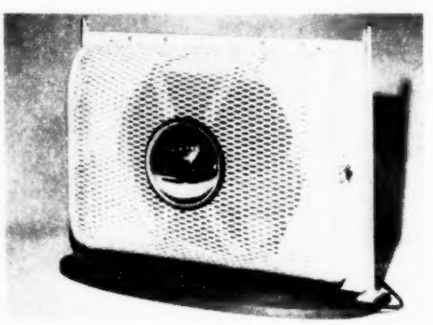


Room Cooler

NAME—Climax D-16 room cooler.

PURPOSE—For cooling one or two rooms.

FEATURES—Unit is designed to fit into the window frame and to draw



in night air. A 3-speed motor is power-balanced with 16-in. propeller. A Venturi orifice is said to prevent expelled air from returning to the room. The high-speed unit delivers 1350 cfm, the medium speed, 1000 cfm, and the low speed, 600 cfm. Extension panel adjusts to windows from 27 to 35.5 inches wide. Extra wide panels are available for windows up to 44 in. wide.

MADE BY—*Climax Machinery Co., 301 So. LaSalle St., Indianapolis 1, Ind.*.....**57**

Exhibited at New York Show

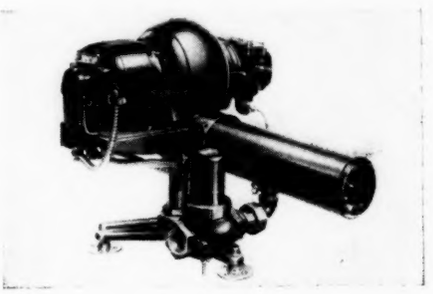
Oil Burner

NAME — Ray Combination Gas-Oil Burner, Type XPC.

PURPOSE — For space heating through the use of a burner operating either with fuel oil or gas.

FEATURES — Unit burns any grade of natural or manufactured oil. It is intended for residential heating or for use in small commercial or industrial buildings. Unit has a combination pressure atomizing type burner combined with a mechanical type gas burner.

SIZES AND CAPACITIES—Three sizes available burning 4, 8, and 19 gph based on 1000 Btu gas and operation at 60 cycles. Maximum gas



inputs are 600,000, 1,200,000 and 2,700,000 Btu per hour.

MADE BY—*Ray Oil Burner Co., 401 Bernal Ave., San Francisco 12, Cal.* **58**

Exhibited at New York Show

Evaporative Condensers

NAME — Recold evaporative condenser.

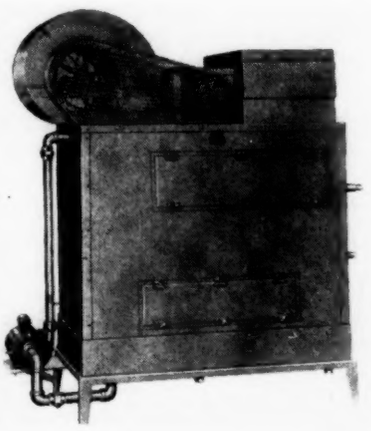
PURPOSE — For heat exchange in cooling vapors and liquids.

FEATURES—Air is brought into the condenser under pressure and is then distributed across cooling coils without the moisture-laden air coming in contact with the fan blades. Makers claim that this eliminates corrosion so common in the fan section of many similar units.

SIZES AND CAPACITIES—From 5 to 100 tons.

MADE BY — *Refrigerating Engineering, Inc., 7250 East Slauson Ave., Los Angeles, Calif.* **59**

Exhibited at Cleveland Show

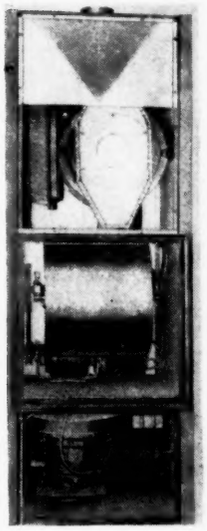


Warm Air Furnace

NAME — G. E. oil fired warm air furnace.

PURPOSE — Oil burning warm air furnace for space heating for small homes.

FEATURES — An air-oil impact method of atomization is used combining low pressure compressed air and oil in a chamber within a spray nozzle. Combustion chamber is horizontal. Design permits the placement of the filter frame on either side or back of the fan housing section. Flue connection is at the top to permit connection in any direction to chimney. Safety features built into the unit include a master control which times the sequence of operations during the starting period. A flame detector shuts off the oil flow in less than 5 seconds in case of flame failure. Units provide all elements of winter air conditioning including automatic humidification and air circulation by a low speed, centrifugal blower.



SIZES AND CAPACITIES — Type LB-15, 60,000 Btu per hr output; type LB-20 output of 85,000 Btu per hr.

MADE BY — *General Electric Co., Bloomfield, N. J.* **60**

Exhibited at Cleveland Show

Fuel Oil Filter

NAME—General fuel oil filter.

PURPOSE—For filtering out impurities in fuel oil tank.

FEATURES—Filter consist of layers of felt to absorb the solids in the oil and a fine mesh screen strainer inside the felt filter as secondary protection. The filter cartridge can be replaced with the help of a single bolt assembly. Inlet and outlet vents are provided.

SIZES AND CAPACITIES — Three models available, all with $^{3}/_{8}$ in. pipe openings, and with filter unit surface of 31, 63 and 72 sq ft.

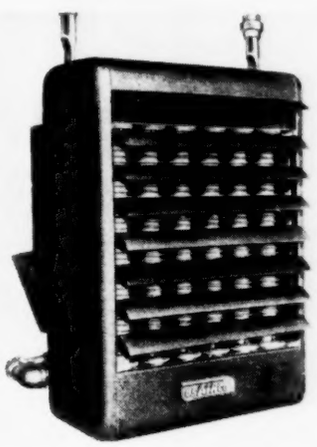
MADE BY—*General Fuel Oil Filter, 12890 Westwood Ave., Detroit 23, Mich.*.....**61**

Exhibited at New York Show

Unit Heater

NAME—Gas fired unit heater.

PURPOSE—Space heating using gas as fuel.



FEATURES—Heat generated by combustion is transferred directly to heat exchangers and by them to the circulated air. Unit delivers 79,600 Btu and has been approved by the AGA. Unit measures 32 by 21 by 22 in. This is the first of several gas units to be produced.

MADE BY—*United States Air Conditioning Corp., Como Ave., S.E. at 33rd St., Minneapolis 14, Minn.*..**62**

Exhibited at New York Show

Condenser

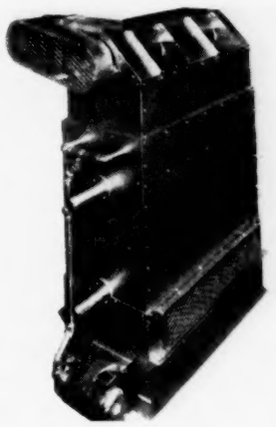
NAME—Type U centrifugal fan condenser.

PURPOSE—Heat exchanger for air conditioning and refrigeration.

FEATURES — Unit has a reversible fan section with angular discharge, and a reversible bottom section. Makers claim good accessibility to all working parts of condenser.

SIZES AND CAPACITIES—10 to 100 tons refrigeration in increments of 5 tons.

MADE BY—*Baltimore Aircoil Company, Inc., 402 Colvin St., Baltimore 2, Md.* **63**



Exhibited at Cleveland Show

Ventilator

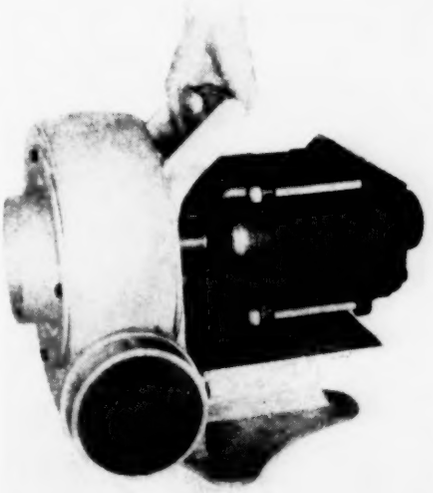
NAME—Safe-T-Air.

PURPOSE—To provide fresh air to men working in confined spaces.

FEATURES — An electric motor driven ventilator weighing 50 lb can deliver 425 cfm. Unit may be used either as a ventilator or exhauster. Spark-proof aluminum is used in its construction. Unit can be plugged in to nearest outlet.

LITERATURE AVAILABLE — Bulletin B148.

MADE BY — *United Electric Motor Company, 178 Centre Street, New York, N. Y.* **64**

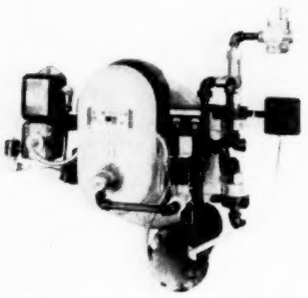


Oil Burner

NAME—Lieblich burner.

PURPOSE — Burner for use with heavy type fuel oils.

FEATURES—Flame shaping features



of burner is said to make unit adaptable for use where combustion space is limited. Burner drive is by twin V belts. Unit burns No. 5 or 6 fuel oil. Housings are of cast iron.

SIZES AND CAPACITIES — 25 to 500 hp.

MADE BY—*Lieblich Burner Service, Inc., 36 W. 66th St., New York, N. Y.* 65

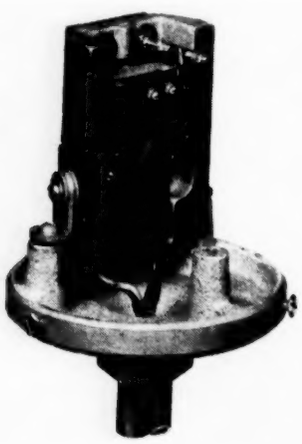
Exhibited at New York Show

Temperature Control

NAME — Honeywell modulating Weatherstat.

PURPOSE — For regulating flow of heat in buildings in proportion to heat loss.

FEATURES—Control can be used either with hot water or steam heating plants. By regulating continuous flow of heat in direct proportion to heat requirements, instrument makes possible greater internal comfort and reduces the danger of overheating during mild weather. System consists of an out-



door unit with a thermostatic control. Control panel contains all adjustments for matching the heating system operation to the design temperature of the zone and the desired temperature level. The reset mechanism also regulates the heat input to compensate for variable heat losses due to wind, and sun effects at different outside temperatures.

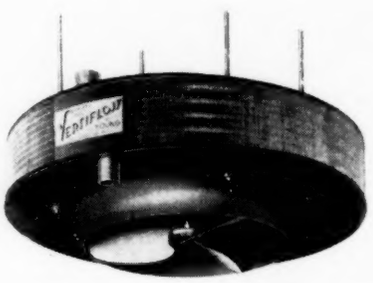
MADE BY—*Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.*.....66

Unit Heater

NAME—Vertiflow.

PURPOSE—Vertical discharge type of unit heater for space heating.

FEATURES—Motor is mounted at the center of the circular heating core which is open at both ends so



that a stack effect is produced to better ventilate the motor. Fans draw room air through the open ventilating stack. Heated air is directed downward. Design is said to reduce noise and to have achieved a 35% saving in total weight of unit. When motor is not operating, the core-heated air rises, passes over the ventilating stack and forms a natural draft.

SIZES AND CAPACITIES—7 models from 52,600 to 552,000 Btu per hr.

MADE BY — *Young Radiator Co., Racine, Wis.* 67

Dual Control

NAME—Yula dual control.

PURPOSE—Unit combining the functions of pressure reducing and pressure relief valves.

FEATURES—Control is an all bronze self-contained unit. Relief valve has a safety test lever. Diaphragms in both valves are oil and water resistant. Working parts are accessible for easy inspection. Unit guards against excessive pressure in the boiler and hot water heating system.

MADE BY—*Yula Water Heaters, Inc., 166 W. 225th St., New York 63, N. Y.* 68

Exhibited at New York Show

Time Switch

NAME — Sangamo type S time switch.

PURPOSE—For the control of electric circuits.

FEATURES — Unit is powered by a synchronous, self - starting, low speed motor permanently lubricated. Switch is designed for easy mounting on a standard switch box or for surface mounting on any wall.

LITERATURE AVAILABLE — Bulletin 1050.

MADE BY—*Sangamo Electric Co., Springfield, Ill.* 69

Condenser

NAME—Kramer Trenton air cooled condenser.

PURPOSE—Air cooled condenser for refrigeration work.

FEATURES—Unit is constructed of aluminum fins and copper tubes. Makers claim a considerable reduction in weight as compared to an all steel condenser. Tubes are of the continuous type so that return bends are eliminated.

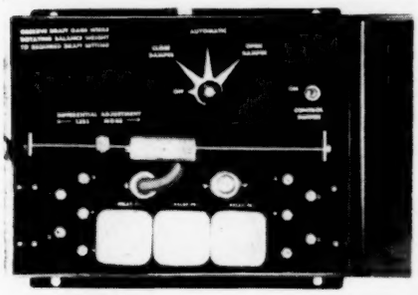
MADE BY — *Kramer Trenton Co., Trenton 5, N. J.* 70

Exhibited at Cleveland Show

Damper Control

NAME—Cleveland Fuel time-delay damper control.

PURPOSE—Electrically operated remote control of stack draft.



FEATURES—A selector switch gives complete manual control when desired. A differential adjustment may be set to provide any sensitivity desired. An emergency cut out switch makes it possible to cut all control and return to manual operation. Three plug-in relays provide the time delay necessary for safe and efficient control. Safeguards are provided which place damper in full open position in case of burner failure (on gas or oil fired boilers) and which shut off burners when selector switch is moved from automatic position during the firing period. Control is said to be suited for the needs of medium and small size boilers.

LITERATURE AVAILABLE—4-page bulletin.

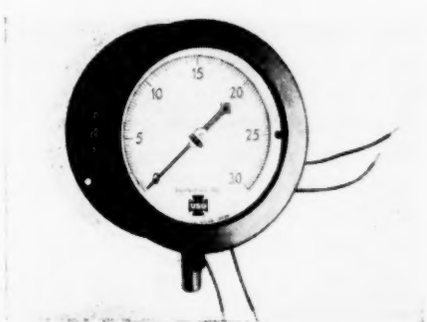
MADE BY—*Cleveland Fuel Equipment Co., 1836 Euclid Ave., Cleveland, Ohio.* 71

Pressure Switch

NAME—Pressure Switch.

PURPOSE — Pressure gage with a switching device.

FEATURES—Units have a switching differential of but 3% of the full scale and an electrical capacity of 10 amps, 125 volts a-c. Two models available. Type VI has an extra Bourdon spring connected to the alarm spring to activate a conventional type indicator. This permits an accurate indication of the pressure being controlled while remaining independent of the setting of the electrical contacts. Gages are available for measuring either temperature or pressure.

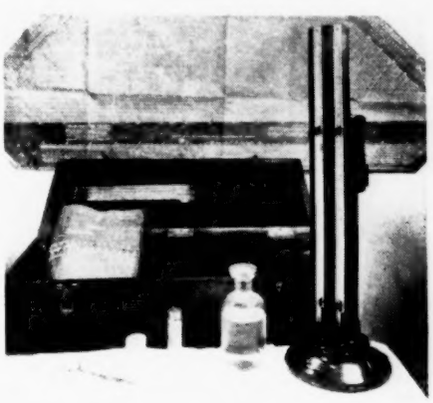


MADE BY — *United States Gauge Division, American Machine and Metals, Inc., Sellersville, Pa.*.....72

Humidity Measurement

NAME—Minneapolis-Honeywell humidity measuring device.

PURPOSE — Accurate measurement of humidity in air.



FEATURES—A motor-driven instrument using matched wet and dry bulb thermometers with scale readings from 40 to 120F. Included with the instrument is a large specially prepared psychrometric chart so that the wet and dry temperature readings may be translated into precise relative humidity percentages. Instrument is said to provide readings to within 1/5 of a degree. Instrument, in addition to the chart, includes a wick, thread, scissors, a bottle of distilled water, carrying case, and an adapter over the thermometer bulbs for readings.

MADE BY — *Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.*.....73

Vapor Seal

NAME—Armstrong sub-zero sealer.

PURPOSE—To keep vapor and moisture-laden air from the insulation space of refrigerated equipment.

FEATURES—Product has a melting point of 240 to 260F. At —10F, a 1/16 in. film on 30 lb kraft paper can be bent slowly, it is claimed, around a 1 in. mandrel without cracking. Makers claim that it will bond tightly to wood, metal, corkboard, glass and other materials and will not crack even at —25F.

MADE BY — *Armstrong Cork Co., Lancaster, Pa.* 74

February 1948

TO OBTAIN FURTHER INFORMATION ON NEW EQUIPMENT

On the list below, circle the item number of the equipment in which you are interested, using the number found at the end of each item.

27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46
47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74		

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NEWS OF THE MONTH

REFRIGERATION SHOW

in the Public Auditorium, Cleveland, well attended; refrigeration associations hold conventions during show week.

More than 5,000 pieces of equipment were displayed in the 75,000 sq ft of space in the Public Auditorium, Cleveland, Ohio, devoted to the Fifth All-Industry Refrigeration and Air Conditioning Exposition, January 26-29. About 10,000 engineers attended the show.

• **MEETINGS.**—During the show week in Cleveland, annual meetings were held by the National Association of Refrigeration Contractors, Refrigeration Equipment Wholesalers Association, National Commercial Refrigerator Sales Association, and meetings were held by the Refrigeration Equipment Manufacturers Association. The tenth annual convention of the Refrigeration Service Engineers Society was held January 21-24 at the Hotel Hollenden.

• **PAPERS.**—At the convention of the RSES papers were presented on Reverse Cycle Refrigeration, by Paul B. Reed, Manager Refrigeration Controls Division, Perfex Corp.

Solids in Refrigerating Systems, by Dr. W. O. Walker, Director of Research and Development, Ansul Chemical Co.

Truck and Trailer Refrigeration, by Albert Swager, Refrigeration engineer, Dole Refrigerating Co.

Two and Three-Stage Systems, by Thomas Lopiccola, Chief Engineer, Refrigeration Division, Bowser, Inc.

Last year the show was held under the combined auspices of the REMA and the locker group interests. This year the show was managed by the REMA. Plans are now being started for the sixth all-industry show to be held in the same exhibition space the week of November 7, 1949.

Some of the new products exhibited for the first time at the show, and not previously described in HEATING AND VENTILATING, are illustrated and described on pages 106-115.

REFRIGERATION SAFETY CODE

to be brought up-to-date by ASA committee sponsored by ASRE.

Up-to-date provisions for the safe use and application of mechanical refrigeration are being prepared by a nationally representative committee working under the leadership of the American Society of Refrigerating Engineers. The committee has been reorganized by the American Standards Association to undertake a revision of the 1939 American Standard Safety Code for Mechanical Refrigeration. The code is being revised with two purposes in mind: (1) to put it in a form that will be most easily used by municipal and state authorities; (2) to bring it up-to-date so that safety requirements will be applicable to all the new types of refrigeration equipment.

• **WHO.**—Dr. William R. Hainsworth representing the ASRE is chairman of the reorganized committee; Harry D. Edwards, International Acetylene Association and National Safety Council, is first vice-chairman; E. T. Benson, Air Conditioning and Refrigerating Machinery Association, is second vice-chairman; and D. F. Hayes, American Standards Association, is secretary.

SYNTHETIC FUELS PLANTS

on full-sized scale needed now, Krug says in progress report on demonstration plants now operating.

Earliest possible construction of the initial commercial plants for the production of oil and gasoline from coal and oil shales was proposed by Secretary of the Interior J. A. Krug in the annual report to Congress on progress of the synthetic liquid fuels research and development program of the Bureau of Mines. Establishment of an American synthetic liquid fuels industry requires far too much time, materials and manpower to be allowed to become necessary in a period of national emergency, he declared.

Demand for petroleum and its products is at unprecedented heights and still rising, Secretary Krug said, and reserve productive capacity is exhausted. At least three synthetic fuels plants—one using oil shale and the others using coal and different extraction processes—should be built as models if this country is to attain maximum progress toward self-sufficiency in oil, he stated.

• **PROGRESS.**—Reviewing 1947 research and development progress of the Bureau of Mines in the field of synthetic fuels, a program undertaken at the direction of Congress to insure the Nation's economic and military security, the Secretary reported substantial strides toward the No. 1 objective—a pattern of scientific, engineering, and economic "Know how" for American industry. Highlights of the report follow:

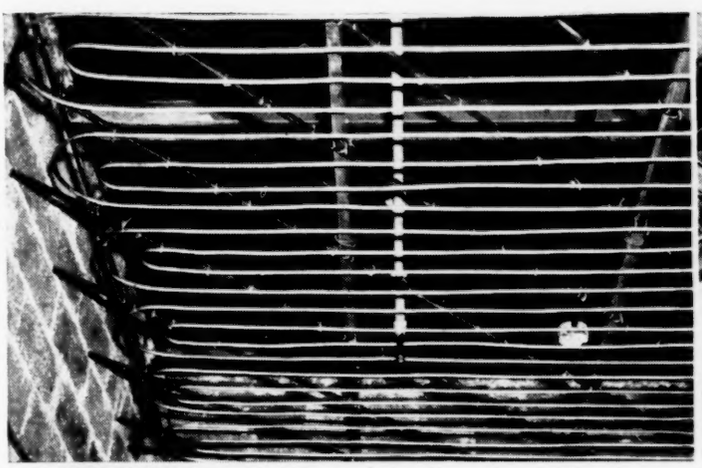
• **OIL-SHALE.**—At Rifle, Colo., the Bureau's oil-shale demonstration plant is producing at a rate of about 50 barrels a day. Concurrently, three additional types of retorting units are being built and will be tested.

By relatively simple refining, crude shale oil yields No. 5 or 6 residual fuel oil suitable for use in ships or utility plants. However, further refining improvements will be required to produce the lighter distillate, Diesel fuel, and gasoline on a commercial basis. To speed refining studies, a cooperative test program will be undertaken with a number of oil companies.

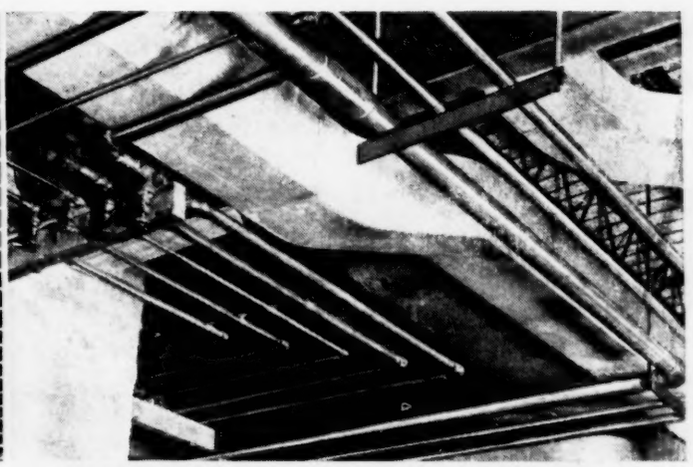
Two shale mines have been opened, one a small selec-

3 types of Systems

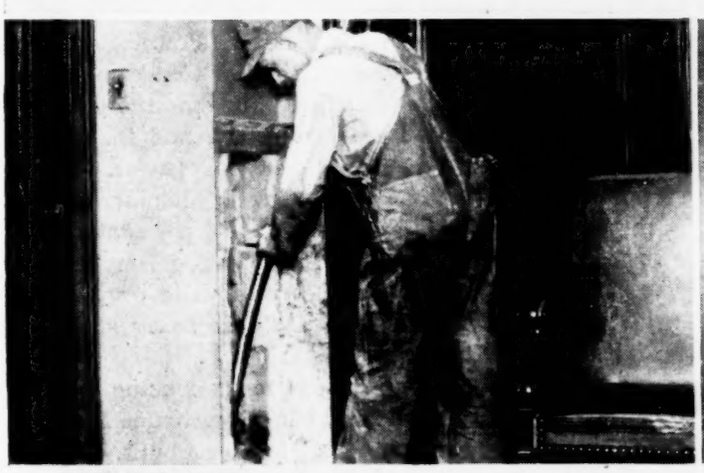
where trouble always costs more than **REVERE COPPER WATER TUBE**



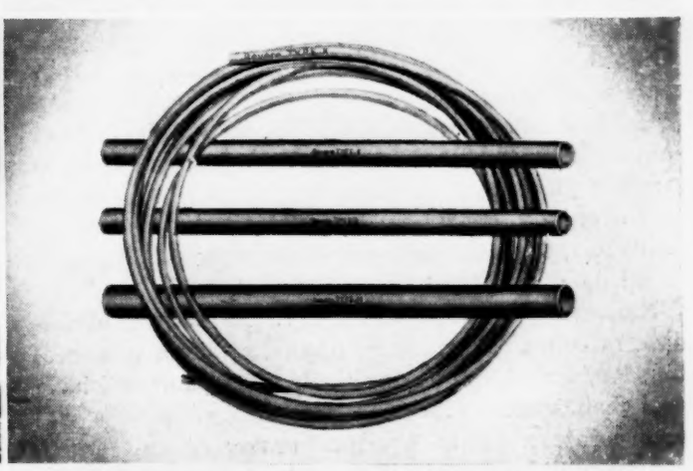
HEATING. When you install hot water, steam or radiant panel heating systems—whether in large commercial buildings or small homes—you save time and trouble with Revere Copper Water Tube. And the permanently smooth interior surface of this tube reduces frictional resistance to a minimum.



WATER SUPPLY. You insure a free flow of sparkling-clear water when you use Revere Copper Water Tube for hot and cold water lines. Because interiors do not become clogged by corrosion, the lines can usually be a size smaller than would be required with rustable pipe.



REPLACEMENTS. Long lengths of soft, easy-to-bend Revere Copper Water Tube enable you to modernize an old plumbing or heating system without tearing floors and walls to pieces. From a small opening, you can feed this tube inside walls and under floors. Joints are easily made with solder or compression fittings.



LOOK FOR the Revere name and the type, which are stamped on Revere Copper Water Tube at regular intervals. These marks are your assurance of full wall thickness and the close gauge tolerances so essential for tight soldered joints.

You get these same advantages when you use Revere Copper Water Tube for drainage systems, underground systems and oil lines. You can specify or install such other long-lived Revere materials as Red-Brass Pipe; Sheet Copper and Herculoy for tanks, ducts, pans and trays; Dryseal Copper and Aluminum Refrigeration Tube (dehydrated and sealed); Copper oil burner, heat control and capillary tubes. The Revere Technical Advisory Service is always ready to serve you. Call your Revere Distributor.

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tive operation for supplying shale of the grade desired at the retorting plant, and the other an underground quarry-like development with a capacity of 1,500 tons a day for improving mining methods and determining costs on a commercial scale. In the latter, production of 25 tons per man day already has been achieved, which compared favorably with the average coal mine output of 5 tons per man shift, and it is anticipated that 40 to 50 tons may be reached in 1948. This work has demonstrated that shale can be mined mechanically for as little as 70 cents a ton, and mining engineers hope to reduce this figure to 50 cents. Tests have shown that large rooms can be opened safely in oil shale without timbering.

• **COAL TO OIL.**—At Louisiana, Mo., a demonstration plant to produce about 200 barrels of gasoline a day by the hydrogenation of coal is under construction on the site of a Government-owned wartime synthetic ammonia plant. To be completed this year, this plant will employ operating pressures ranging from 4,000 to 10,000 lb per sq in. The demonstration plant will use from 100 to 200 tons of coal or lignite daily.

Under present conditions and with Bureau-developed process improvements, including heat efficiencies more than 20% better than the Germans were able to attain, it is estimated that a high-grade motor gasoline or aviation gasoline can be produced commercially from coal for about 14 cents a gallon, some 5 to 7 cents more per gallon than the current cost of gasoline from petroleum. This estimate includes an allowance for plant amortization but otherwise includes an estimate for only production costs. On the other hand, no credit has been taken for by-products which may reduce the cost of the product in some plants by 3 to 5 cents a gallon.

If funds are available, construction will begin next summer on a gas synthesis (Fischer-Tropsch) demonstration plant to produce motor gasoline and Diesel fuel from coal. This plant also will be erected at Louisiana, Mo., and will make about 50 to 80 barrels of oil daily.

Employing product cost-reduction features developed in Bureau laboratories and pilot plants at Bruceton, Pa., and Morgantown, W. Va., this plant will have coal-gasification units of a new design. It also will incorporate a newly-developed converter unit which can be built to produce 500 or more barrels daily as compared to a capacity of 18 barrels a day for the German converters. A good grade of motor gasoline and an excellent Diesel fuel can be produced through this process at costs which probably approximate those of the coal hydrogenation process. Although estimates have been made, they require verification in actual operation of a demonstration plant.

• **RESEARCH.**—At Laramie, Wyo., a new oil-shale research and development laboratory building has been completed, providing the space and facilities needed for determining the fundamental chemical, physical, and engineering facts of oil-shale processing. Engine tests were started on shale gasoline and Diesel fuel to determine their characteristics for use in internal combustion engines. Retorting research tests have made known some of the time and temperature relationships involved in converting shale's organic content into oil, and apparatus has been built for determining total heat requirements. In refining research, work has continued on thermal and catalytic cracking of shale-oil fractions and the catalytic treating of shale-oil napthas. Results are encouraging but several problems arising from the high sulfur and nitrogen content of the cracked gasoline remain to be solved before the processes can be put into pilot plant operation. Assays for oil yield have been made on approximately 1,400 shale samples, largely from core-drill holes on the U. S. Naval Oil-Shale Reserve No. 1 in Colorado.

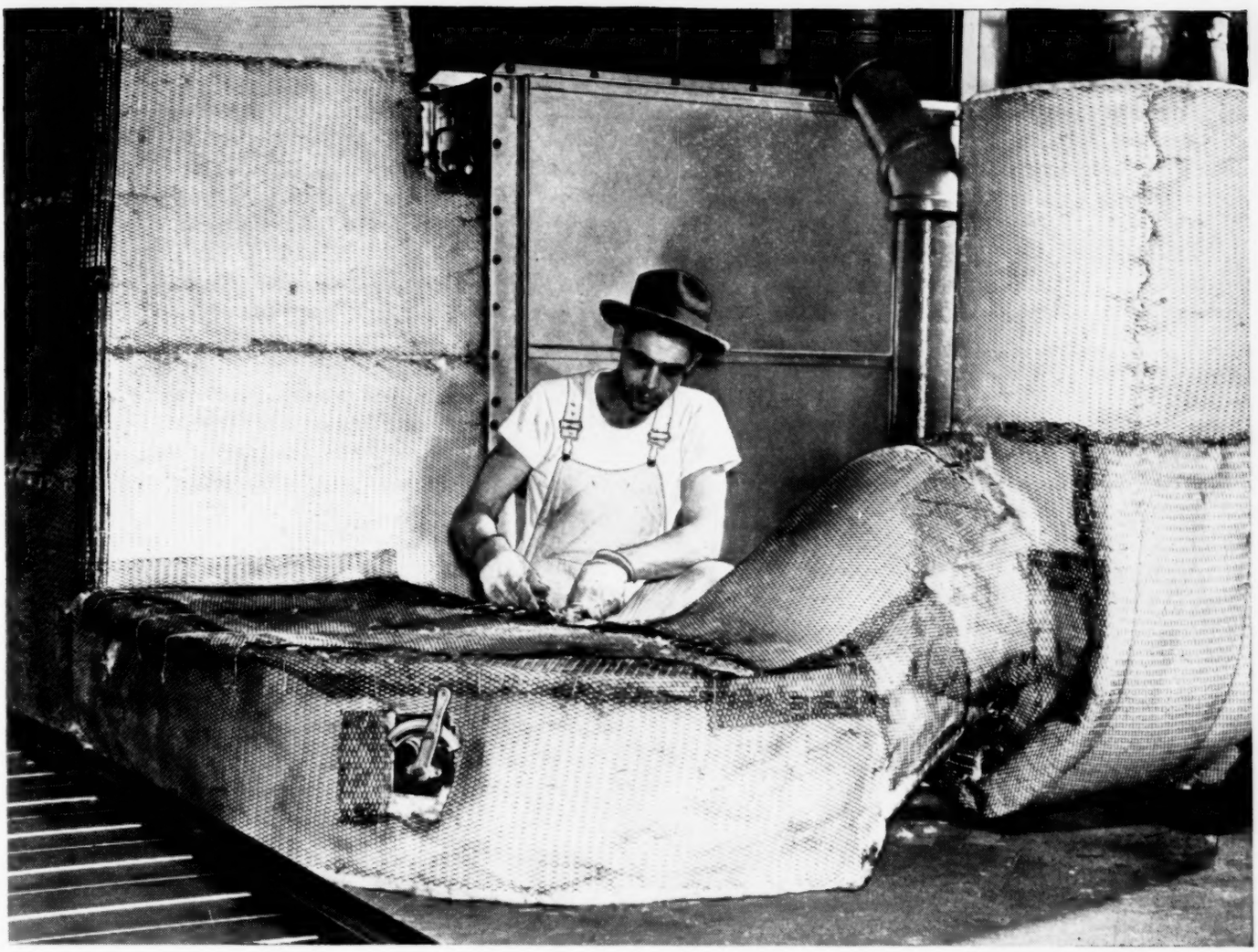
• **SYNTHESIS GAS.**—At Morgantown, W. Va., site of the synthesis gas laboratory and pilot plant unit, encouraging progress was made on processes for cheap production of the carbon monoxide and hydrogen required in synthetic fuels manufacture. In the Bureau's laboratories, three processes were under study for making this synthesis gas, the major cost factor in the finished product and the most important single research problem: (1) gasification of coal in place underground; (2) gasification of pulverized coal entrained in superheated steam containing oxygen; (3) gasification of powdered coal with oxygen and steam in a vortex reactor.

Underground coal gasification, offering the initial advantage of saving mining costs, perhaps is the most interesting. A field test conducted at Gorgas, Ala., with the cooperation of the Alabama Power Company yielded promising results. It showed that combustion can be maintained in unmined coal, that the coal can be gasified and consumed completely, and that gases produced can be used for generating power. If the operation can be conducted with oxygen and under pressure, very high temperatures and a suitable synthesis gas should be obtained. Many problems remain to be solved, however. Further work is in progress in the laboratory, and detailed plans are being made for additional field tests.

A laboratory-scale apparatus for producing synthesis gas from pulverized coal is in operation at Morgantown, and a larger pilot plant is being built. In this process, too, results promise material cost reductions for synthesis gas, now made commercially in this country only in the standard water-gas sets. New methods for purifying synthesis gas also are under study there.

At Pittsburgh, Pa., an experimental vortex reactor for gasification of powdered coal with oxygen and steam has been built and is under test at the Bureau's experiment station. Heat loss from the unit, which has a design capacity of about 100 pounds of coal per hour, is estimated to be less than 5%. If successful, it should be adaptable to almost any type of coal.

At Bruceton, Pa., structures to house the main coal to oil laboratories and pilot plants were substantially



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ompleted in 1947 and Bureau personnel took possession, moving from temporary quarters at Pittsburgh as space became available. Meanwhile, research continued on the hydrogenation and gas synthesis methods of converting coal to oil, and process improvements offered promise of further material cost reductions.

(Hydrogenation is the only large-scale synthetic process now well adapted to the production of aviation gasoline from coal, yielding a base stock for 100-octane gasoline with good rich-mixture performance. It does not produce a Diesel fuel of as high a quality as the gas synthesis process, but may offer a good method of obtaining fuel oil.)

In the coal hydrogenation field, high yields of distillate were obtained in experiments conducted on steam stripping of heavy-oil slurry. This eliminates the unsatisfactory centrifuging and coking operations employed in German plants to purge ash and other unreacted solids. Effective new catalysts were discovered which reduce the amount of asphalt present in the primary product and largely or wholly eliminate the use of the strategic and critical tin previously required. Equipment was installed for the separation and identification of synthetic fuel components, some of which may offer sources of special fuels and chemical by-products and thus reduce processing costs. Bench-scale units were designed and fabricated for hydrogenating coal in a dry or powder state, a discovery which constitutes a radical departure from European practice.

In the gas synthesis field, production rates several times those in German plants were achieved in a redesigned and rebuilt pilot plant employing an internally-cooled converter developed by the Bureau. In addition, bench-scale experiments were made on other processes including the liquid-phase catalyst suspension, hot gas recycle, and fluidized fixed bed. Work on the latter process is particularly important in the design of projected commercial plants for the production of synthetic liquid fuels from natural gas.

• **ALCOHOL.**—At Peoria, Ill., the Department of Agriculture has placed in operation a small semi-works plant to determine the manufacturing steps and costs for producing alcohol and other liquid fuels from agricultural residues. The process, developed by the Bureau of Agriculture and Industrial Chemistry, consists of converting the pentosan fraction of the agricultural residues to pentose sugars and, subsequently, the cellulose fraction to dextrose which are then converted to the liquid fuels butanol, isopropanol, acetone, ethanol or furfural.

Opening a new avenue for liquid fuel production, two contributions made in 1947 are deemed of major importance: (1) demonstration that the pentosan fraction of corncobs can be satisfactorily hydrolyzed to pentose sugars with high yield; (2) development of an efficient process for fermenting the sugars in pentosan hydrolysates to liquid fuels.

• A group of scientists conducting experiments at the University of California reported that they had spent *nearly 15 minutes in a room heated to 250F* and had suffered no ill effects. Dr. Craig Taylor, associate professor of engineering, used himself and assistants as subjects in the experiments.

Members of the staff of Baker, Smith & Co., New York City heating, piping and ventilating contracting organization, at a dinner at the New York Athletic Club, December 18, commemorating the 90th anniversary of the founding of the firm. Baker, Smith has an impressive record of large jobs, including Empire State Building, Grand Central Terminal, Waldorf-Astoria, Parkchester Housing Development and dozens of others.

Fast to work... slow to rust

Beth-Cu-Loy GALVANIZED Steel Sheets

In selecting steel sheets your first consideration is their workability. Can they be formed smoothly, cut readily and soldered easily to do a top-grade job in the shortest possible time? With Beth-Cu-Loy Galvanized Sheets the answer is yes. Sheet-metal contractors find in them the uniformity and ductility needed for clean, rapid work.

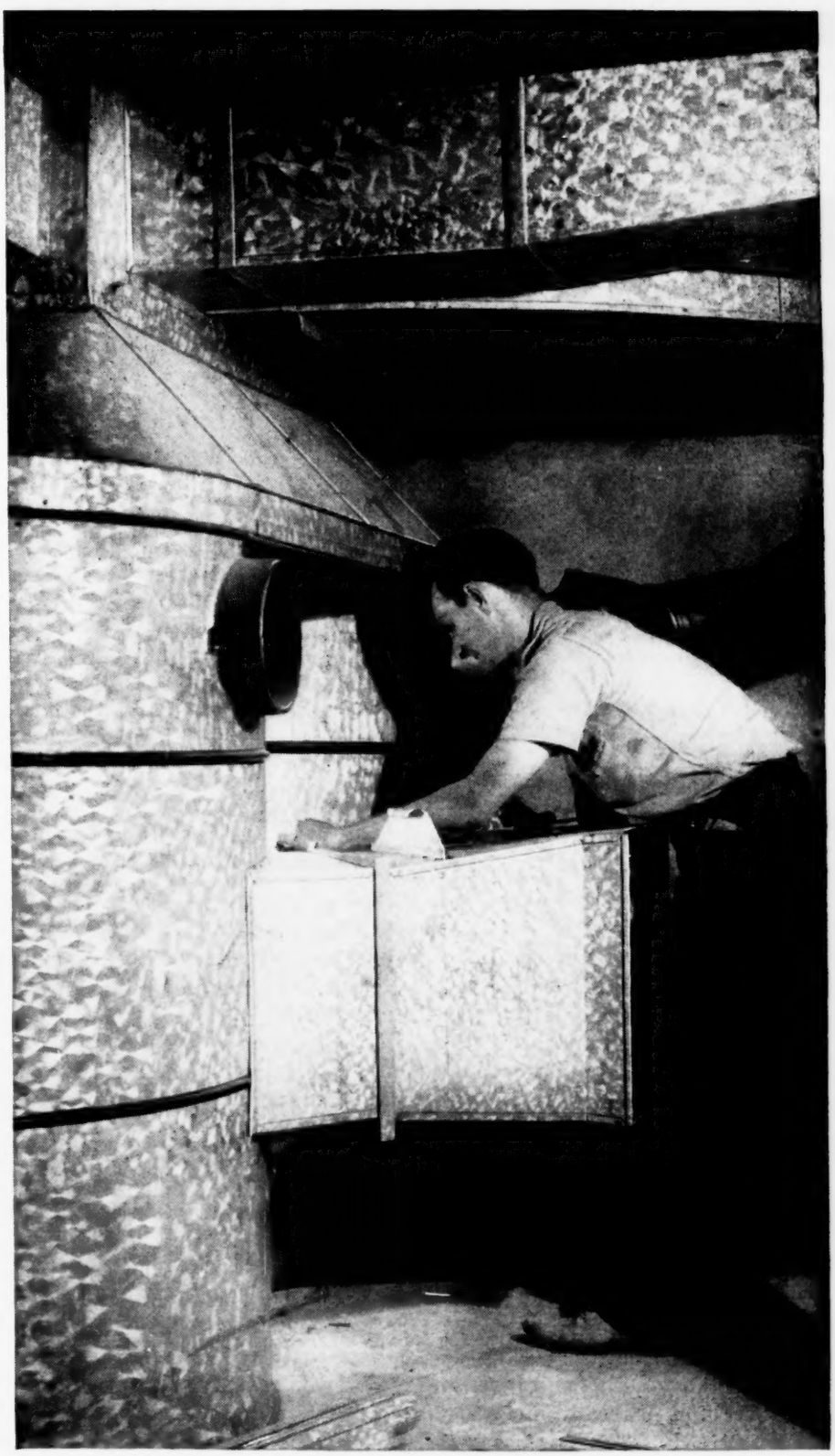
Your next concern in selecting sheets is their resistance to rust. Home owners and other customers expect sheet-metal work to stand up well against corrosion. Give them jobs that last and you get customer goodwill in return.

Beth-Cu-Loy Galvanized Sheets have the corrosion-resistance that assures longer life for ductwork, window frames, cornices and similar installations. These sheets are protected on the surface by a bright coating of Prime Western zinc and under the surface by a base of copper-bearing steel with from 2 to 2½ times the rust-resistance of plain carbon steel.

Bethlehem Steel Company, Bethlehem, Pa.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

★ BETHLEHEM STEEL ★

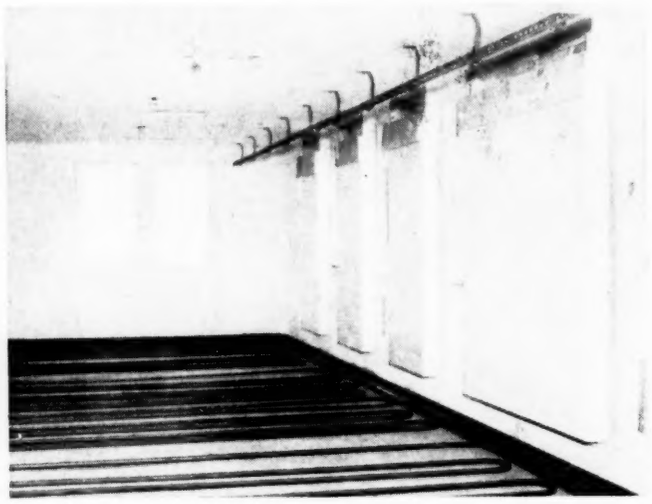


RADIANT HEAT FOR CHICKS

ups production, cuts costs, and controls disease for Pennsylvania poultryman.

A three-story, radiant heated brooder house, 100 ft long and 22 ft wide has stepped up poultry production on the range of Charles Henninger, poultryman, near Millersburg, Pa. Constructed of cinder block and concrete frame, the brooder is thoroughly insulated and provided with an ingenious ventilating system. Radiant heat has done away with brooder stoves and hovers. Chicks will be raised on warm dry floors, protected from drafts and supplied with plenty of light and fresh air.

Mr. Henninger said he had read of radiant heating in magazine articles and determined to try it out in



Rayduct grid embedded in floor of each brooder house.

the new building in joint operation with electric heaters in the hovers, placing the pipes in the walls. Further investigation and visits to other brooder plants where radiant heating is employed convinced him that this was the ideal heating medium and the answer to some of the problems that vex the poultry raiser.

• **DISEASE CURB.**—Control of coccidiosis is one benefit of radiant heating. Germ of this dread disease, which has taken the lives of countless thousands of chicks, is bred in damp litter. Radiant heat, by keeping the litter dry, helps curb this killer.

• **LESS WORK.**—Labor-saving is another. Ordinarily, litter must be changed every few weeks, and more frequently when the weather is damp. Henninger estimates that he will not have to change the litter except when he changes the flock and makes ready for a new influx of chicks, or about every 12 to 13 weeks. Thus he will save several days work.

• **BUILDING.**—First floor of the new brooder house is given over to machinery sheds, a workshop, and the boiler room, the latter housing a circulator-equipped hot water heater that will burn barley or river coal, thus effecting a substantial saving in fuel costs. The boiler is rated at 3750 sq ft of water radiation.

The second floor has two brooder rooms, each 22 x 48 feet, and a central hall between. Two similar rooms on the third floor are 24 x 48 feet, the additional two feet width being due to a one foot overhang all around the building which protects the ventilating louvers. The halls house food bins, a motorized feed grinder and mixer, and a small elevator for bringing up bulk feed and other material.

• **SYSTEM.**—Brooder rooms on the 2nd and 3rd levels are floored with concrete, sloped toward drainage channels. Radiant heat coils of Rayduct, Bethlehem Steel Company's special steel piping for radiant heating, are laid in the concrete about two inches below the surface. The system is a sinuous coil arrangement running the width of the brooder rooms. Each room is divided into four coil zones, the water flowing through each zone being governed by a hand gate valve, which makes it possible for four different floor temperatures to be maintained simultaneously in each room. The temperature within the room is controlled by means of a room thermostat operating a motorized valve, so that each room may be kept at any desired individual temperature.

A valuable "assist" is given the ventilating system by the radiant heat installation. The intakes for fresh air are directly over the heavy header pipes which will warm and dry the incoming air before it reaches the chicks. Flues with dampers control the outdraft.

• **CONTROL.**—The entire heating system is primarily controlled by an outdoor weather-anticipating bulb operating through a control panel, which will modulate the water temperature going to the radiant heating coils to compensate for fluctuations in outdoor temperatures.

In the event of electric power failure, provisions have been made to hand-fire the boiler and to run the circulating pump by means of an emergency gasoline engine through a V-belt connection.

The system was designed, fabricated, and installed by Radiant Heat, Inc., of Easton, Pa.

GAS INDUSTRY

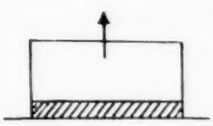
shows gains on all fronts in 1947, says AGA official.

The gas industry continued its unbroken record of expansion in 1947, scoring significant gains in many directions, according to a year-end report released by Hudson W. Reed, president of American Gas Association and the Philadelphia Gas Works Co. In that year, says Mr. Reed, the gas industry served more people than ever before and its revenues from all classes of service reached an all-time peak. Reflecting the great industrial and business activity, revenues from commercial and industrial gas sales advanced more than in any previous year in the past decade, including the previously unmatched war years.

• **STATISTICS.**—At the end of the year there were

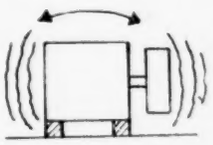
Don'ts for machine isolation

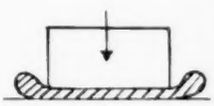
When you are called on to isolate a machine against the transmission of vibration avoid these pitfalls



Don't put a solid sheet of cork, rubber or other material under the complete base. Nine chances out of ten it's too much, it won't help much and you are wasting your money. Isolation must be right or it is no good.

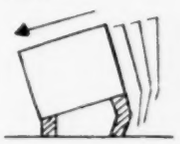
Don't neglect the overhang of the drive. If you do, your machine will rock excessively. Extend the base and the isolation out under the drive, and your rocking troubles will be minimized.





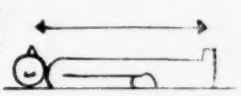
Don't use a material that will soften in warm weather and flow out from under the base. It's just as bad to use a material that will harden in cold weather. Either will give you questionable isolation only in spring and fall.

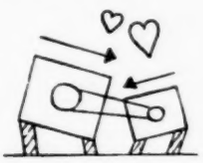
Don't ignore uneven weight distribution. If you do, the isolation will compress unevenly and the machine will tip. Excessive tipping or rocking may lead to serious trouble.



Don't use a brittle isolator. Avoid materials that harden with age or vibration. Impact will break it up and the floor sweeper will brush it away.

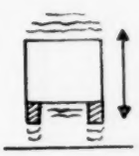
Don't use a dead or lifeless material. Such materials may absorb vibration when first installed, but in time they pack and settle, which means that they no longer isolate.





Don't encourage affectionate machines. If a fan and it's motor are both separately, resiliently mounted, they tend to nod to each other with resulting drive distortion. Have a rigid base on top of the isolation.

Don't make a bouncing ball out of your machine. It's important that the isolation be just right, not too hard nor too soft. At one point in its softness resonance develops and with it plenty of trouble.



Machinery isolation is our business. We have a complete selection of units and bases that avoid all of these difficulties. They save you valuable installation time and engineering headaches.

Write for complete literature.

THE VIBRATION ELIMINATOR COMPANY

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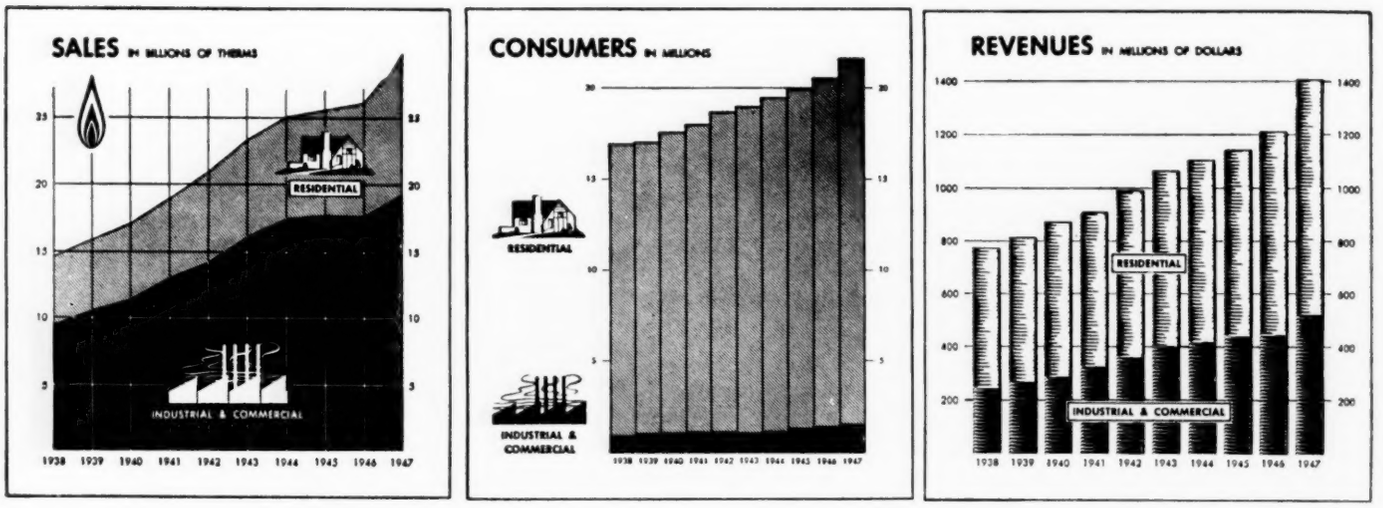
THE Vibration Eliminator COMPANY



Trends of utility gas sales, consumers, and revenues (1947 data estimated)

21.6 million customers of gas utility companies, equivalent to an increase of 3.2% over 1946. Of this number, 10.3 million were receiving natural gas, 8.8 million were receiving manufactured gas, and 2.4 million were served with mixed gas. In addition, it is estimated that 3.5 million customers were being served with liquefied petroleum gas from individual tanks in territories beyond the reach of utility gas mains.

Total revenues of the utility gas industry during 1947 were $1.4 billion, a gain of 16.2% compared with the previous year. This is a greater gain than has been recorded recently in any other single year. Since 1941, total revenues have advanced 54%. Increases were substantial in all three major gas types in 1947 with natural gas revenues gaining 20.0%, mixed gas 12.7% and manufactured gas 9.8%.

Broken down by class of service, revenues from sales to commercial consumers showed the largest gain, 19.5%, while residential revenues advanced 16.3%, and industrial revenues were 15.8% higher than in the previous year.

Utility sales of natural gas during 1947 were 2.5 trillion cu ft, an increase of 14.1% over sales in the previous year. Mixed gas sales amounted to 176 billion cu ft, an advance of 18.7% and manufactured gas rose 8.4% to 439 billion cu ft.

Faced with an almost insatiable demand for gas service, the gas utilities expanded their production and distribution system at a pace far exceeding any previous period in their history. Construction expenditures in 1947 were approximately $730 million, more than double the 1946 expenditure of $310 million which was the all-time previous peak. Prior to 1946 the annual construction expenditures of the gas utility industry had never exceeded $162 million, thus throwing into sharp focus the accelerated pace of the current expansion program.

• **NATURAL GAS EXPANSION.**—By far the most phenomenal expansion has been in the natural gas branch of the industry. Construction and operation of new facilities during the year have increased the capacity of the nation's pipeline system by nearly two billion cubic feet per day, which is the equivalent of about 80,000 tons of coal. Such construction added 5,370 miles of pipe lines bringing the network up to 229,000 miles, or the same mileage as trunk line railroad tracks in this country. More than twice as much gas pipe line construction was authorized by the Federal Power Commission in 1947 as in any previous year.

Natural gas reserves appear adequate to meet these tremendous new demands for many years to come. The reserves committee of the American Gas Association estimated the proved recoverable reserves of natural gas in the United States at the end of 1946 as 160.6 trillion cu ft. This represents an increase of 12.8 trillion cu ft or an increase over the previous year of two and one-half times the amount withdrawn. Year by year estimates of natural gas reserves have increased until today they represent an advance of 600% above 1925, 160% above 1934 and 90% more than 1940.

EXHAUST CODE

to be reviewed, perhaps revised, by groups reorganized under ASA sponsorship.

The Sectional Committee for the Safety Code for Exhaust Systems, Z9, of the American Standards Association, inactive during the war, has been reorganized and held its first meeting in December. Theodore F. Hatch, representing the American Industrial Hygiene Association, was elected chairman of the committee. Action was taken to reactivate the work of the group in developing safety standards for exhaust ventilation of injurious dusts, gases, and vapors.

• **REVIEW.**—Dr. Allen D. Brandt, representing the American Public Health Association, was appointed chairman of a subcommittee to review the Funda-

(Continued on page 134)

TAKE THE GUESSWORK OUT OF SELECTING
AIR CONDITIONING GRILLES *and* REGISTER SIZES

Specify... Install

T&B STANDARDS

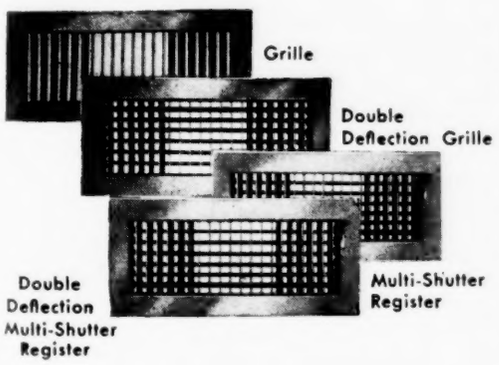
Check the size of grilles and registers you normally install for air conditioning jobs . . . then check the standard Tri-Flex and Aerovane sizes.

You'll readily see why T&B STANDARDS meet practically all requirements . . . how they eliminate haphazard selection that can be exceedingly troublesome. And there are other important advantages of standardization . . . efficient production methods mean cost savings . . . on-the-shelf stock assures quick delivery.

FOR SUPPLY

Tri-Flex

26 STANDARD SIZES



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36 x 12

FOR RETURN

Aerovane

20 STANDARD SIZES

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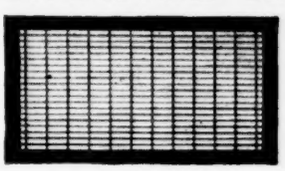


Grille

Multi-Shutter Register

FOR DETAILED DESCRIPTION, ENGINEERING DATA AND COMPLETE SELECTION INFORMATION . . . WRITE TODAY FOR A COPY OF BULLETIN 47TF.

TUTTLE & BAILEY

NEW BRITAIN, CONNECTICUT

3TB48

DEGREE-DAYS FOR DECEMBER, 1947

HEATING AND VENTILATING's 21st Year of Publication of Monthly Degree-Day Data

City	December			Cumulative, Sept. 1, 1947 to Dec. 31, 1947			Heating Season[1]
	1947	1946	Normal	1947	1946	Normal	Normal
Abilene, Texas	546	458	592	1005	830	925	2061
Albany, New York	1316	1134	1147	2644	2240	2439	6580
Albuquerque, New Mexico	942	763	924	1848	1752	1827	4298
Alpena, Michigan	1199	1223	1247	2641	2668	2951	8299*
Anaconda, Montana	1161	1167	1238	3187	3534	3171	8357**
Asheville, North Carolina	761	696	837	1569	1325	1689	4232
Atlanta, Georgia	570	487	639	1118	812	1131	2890
Atlantic City, New Jersey	897	719	893	1655	1276	1735	5176
Augusta, Georgia	527	418	549	928	630	886	2161
Baker, Oregon	1101	998	1156	2708	2938	2815	7163
Baltimore, Maryland	865	699	874	1595	1223	1664	4533
Billings, Montana	1146	1107	1194	2764	3007	2816	7119
Binghamton, New York	1156	1017	1156	2368	2028	2515	6808
Birmingham, Alabama	590	500	595	1062	830	913	2352
Bismarck, North Dakota	1571	1505	1553	3486	3633	3514	9192
Block Island, Rhode Island	956	811	884	1865	1527	1736	5788
Boise, Idaho	1046	893	1011	2365	2494	2285	5552
Boston, Massachusetts	1073	940	1026	2089	1746	2130	6045
Bozeman, Montana	1255	1110	1293	3207	3291	3286	8521**
Buffalo, New York	1135	1037	1104	2302	2032	2372	6822
Burlington, Vermont	1424	1209	1287	2848	2490	2773	7514
Butte, Montana	1283	1223	1261	1223	3707	3183	8235**
Cairo, Illinois	755	636	822	1430	1139	1499	3909
Canton, New York	1447	1272	1342	2939	2634	2994	8020
Charles City, Iowa	1330	1207	1390	2754	2588	2895	7588
Charleston, South Carolina	420	313	425	676	435	632	1769
Charlotte, North Carolina	665	538	679	1267	912	1220	3120
Chattanooga, Tennessee	716	626	694	1280	1090	1225	3118
Cheyenne, Wyoming	1095	944	1144	2774	2847	2889	7466
Chicago, Illinois	1015	960	1074	2089	1870	2172	6077
Cincinnati, Ohio	858	767	927	1669	1368	1796	4684
Cleveland, Ohio	1040	960	1060	2124	1814	2185	6155
Columbia, Missouri	823	807	985	1665	1540	1896	4922
Columbia, South Carolina	539	409	561	978	644	916	2364
Columbus, Ohio	983	881	1017	1916	1619	2020	5398
Concord, New Hampshire	1351	1235	1234	2815	2550	2732	7353
Concordia, Kansas	1010	921	1050	1983	1939	2019	5315
Dallas, Texas	512	397	567	933	717	870	2256
Davenport, Iowa	1066	1004	1175	2213	1966	2333	6289
Dayton, Ohio	1058	937	1014	2110	1771	1947	5264
Denver, Colorado	900	790	1017	2150	2219	2276	5874
Des Moines, Iowa	1108	1038	1215	(a)	2143	2370	6384
Detroit, Michigan	1117	1019	1113	2280	1964	2332	6490
Devils Lake, North Dakota	1726	1672	1710	3801	3990	3871	9970
Dodge City, Kansas	1018	821	1004	1976	1878	1952	5035
Dubuque, Iowa	1150	1078	1243	2414	2217	2534	6790
Duluth, Minnesota	1530	1588	1519	3484	3563	3489	9483
Eastport, Maine	1275	1191	1228	2671	2560	2890	8520**
Elkins, West Virginia	1024	903	1035	2185	1950	2217	5697
El Paso, Texas	683	555	617	1188	1051	1038	2428
Ely, Nevada	1081	1055	(a)	1819	2108	(a)	(a)
Erie, Pennsylvania	1018	906	1039	2038	1714	2164	6273
Escanaba, Michigan	1277	1321	1344	2824	2937	3138	8771
Evansville, Indiana	873	749	862	1734	1471	1545	4244
Fort Smith, Arkansas	661	531	707	1214	1020	1177	3147
Fort Wayne, Indiana	1121	1001	1138	2311	2014	2211	5925
Fort Worth, Texas	525	412	574	934	725	826	2148
Fresno, California	612	602	577	1112	1172	911	2334
Galveston, Texas	287	203	270	408	322	330	1016
Grand Junction, Colorado	1129	1003	1162	2358	2362	2278	5548
Grand Rapids, Michigan	1081	1025	1147	2255	2015	2397	6535
Green Bay, Wisconsin	1318	1312	1324	2777	2723	2882	7825
Greensboro, North Carolina	798	664	760	1552	1215	1395	3529
Greenville, South Carolina	660	535	738	1247	928	1334	3380
Harrisburg, Pennsylvania	1005	887	992	1972	1689	1981	5375
Hartford, Connecticut	1154	1013	1060	2309	1930	2157	6036
Hatteras, North Carolina	501	350	493	774	491	727	2571
Havre, Montana	1213	1400	1383	3051	3675	3314	8700
Helena, Montana	1184	1204	1245	3089	3458	3058	7984**
Houston, Texas	297	212	335	479	354	449	1157
Huron, South Dakota	1505	1312	1431	3171	3111	3085	8004
Indianapolis, Indiana	970	852	1017	1940	1574	2002	5298
Jackson, Mississippi	468	385	(a)	815	610	(a)	(a)
Kansas City, Missouri	859	807	1008	1725	1558	1866	4956
Kewanee, Illinois	1096	994	1118	2394	1987	2311	6139
Knoxville Tennessee	748	647	781	1340	1164	1483	3670
La Crosse, Wisconsin	1451	1293	1311	2953	2744	2778	7322
Lander, Wyoming	1260	1082	1419	3091	3190	3075	7947

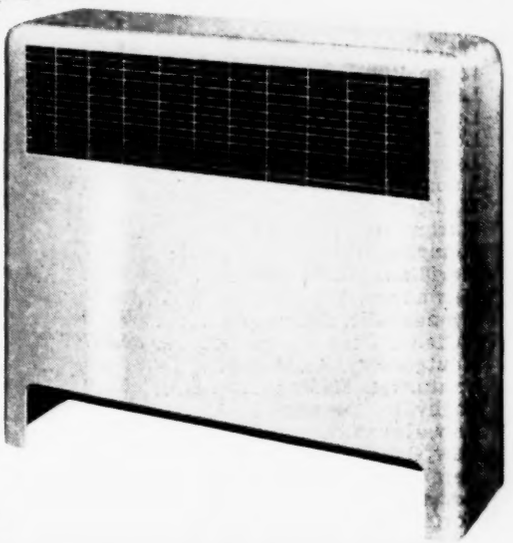
(a) Data not available.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Figures in this table, with nine exceptions, based on local weather bureau reports. Exceptions are Utica, Lewiston, Kewanee, Sioux City, and Jackson, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y.; Norman E. Ross, Burgar, Bates College, Lewiston, Me.; J. M. Hartman, Engineering Department, Kewanee Boiler Corp., Kewanee, Ill.; Alfred R. Wagstaff, Engineer, Sioux City Foundry and Boiler Co., Sioux City, Iowa, and H. M. Ludlow, Box 1368, Jackson, Miss., respectively; Anaconda, Bozeman, Butte and Livingston, Mont., through the courtesy of the Montana Power Company.

[Table concluded on Page 128]

Clean, Safe, Economical HEATING with AIRTHERM CONVECTORS



AIRTHERM CONVECTORS for hot water and steam heating systems provide the desirable combination of convection and radiant heating. The attractive cabinets can be readily finished after installation in any color to harmonize with interior decorations.

AIRTHERM CONVECTORS are available in three cabinet styles—Type F, free standing or partially recessed; Type W, wall cabinet; and Type S, sloping top wall cabinet—in a complete range of depths, heights, and lengths.

Have you recently investigated the advantages of specifying and installing convectors? Write for new bulletin describing AIRTHERM CONVECTORS.

AIRTHERM MANUFACTURING CO.

722 South Spring Ave. • St. Louis, Mo.

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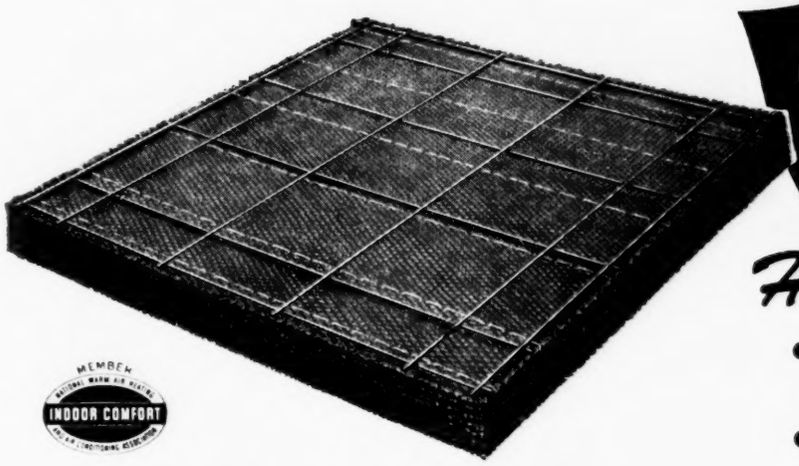
Install the FOREMOST FILTER *for-*



C CONTINUOUS A AIR C CIRCULATION

Here's why—

- Removes more dust, pollen, lint — (by actual test)
- Won't shed, pack or settle — no blow-holes
- Self-Seal Edge prevents by-pass of unfiltered air
- Greater load-carrying capacity for best C-A-C performance
- Greater unobstructed filter area

MEMBER INDOOR COMFORT

RESEARCH *Self-Seal* AIR FILTERS

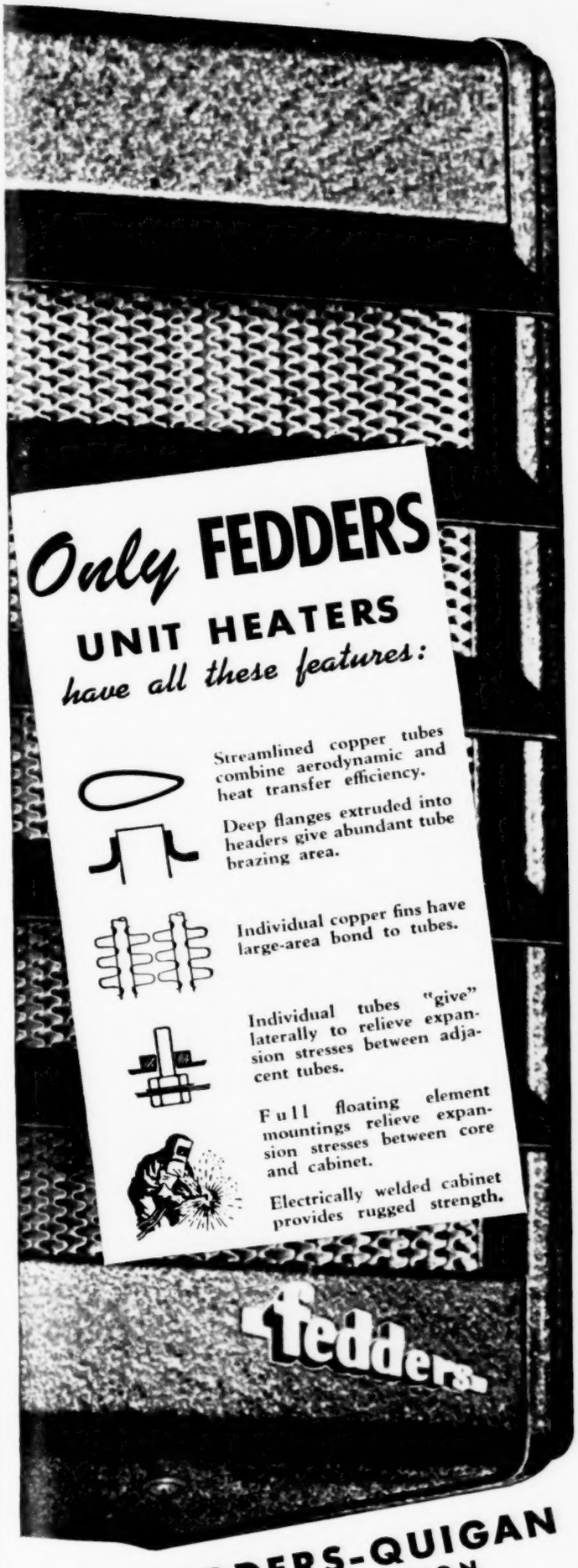
RESEARCH PRODUCTS CORPORATION, MADISON 3, WISCONSIN

Degree-Days for December, 1947 (Concluded)

HEATING AND VENTILATING's 21st Year of Publication of Monthly Degree-Day Data

City	December			Cumulative, Sept. 1, 1947 to Dec. 31, 1947			Heating Season[1]
	1947	1946	Normal	1947	1946	Normal	Normal
Lansing, Michigan	1169	1080	1209	2516	2202	2665	7048
Lewiston, Maine	1285	1254	1295	2690	2663	2837	7707
Lincoln, Nebraska	1100	992	1132	2196	2066	2201	5999
Little Rock, Arkansas	603	491	651	1137	945	1079	2811
Livingston, Montana	1109	1038	1117	2852	3116	2731	7245**
Los Angeles, California	260	266	301	457	531	424	1504
Louisville, Kentucky	804	708	849	1569	1295	1587	4180
Lynchburg, Virginia	828	698	800	1685	1306	1557	3980
Macon, Georgia	536	431	567	961	693	897	2201
Madison, Wisconsin	(a)	1181	1321	(a)	2428	2758	7429
Marquette, Michigan	1302	1324	1302	2909	2925	3054	8693*
Memphis, Tennessee	637	510	663	1165	926	1127	2950
Meridian, Mississippi	484	427	549	851	695	883	2160
Milwaukee, Wisconsin	1191	1153	1221	2501	2395	2601	7245
Minneapolis, Minnesota	1466	1376	1404	3031	2966	2941	7850
Modena, Utah	1267	969	1168	2830	2660	2672	6562
Montgomery, Alabama	429	360	496	755	540	769	1884
Nantucket, Massachusetts	1000	846	905	2070	1698	1912	5957
Nashville, Tennessee	733	597	744	1338	1071	1363	3507
New Haven, Connecticut	1070	954	1017	2157	1801	2109	5895
New Orleans, Louisiana	286	196	301	476	275	403	1024
New York, New York	963	832	940	1804	1442	1856	5274***
Nome, Alaska†	1424	1544	1509	3417	3221	3379	14580**
Norfolk, Virginia	671	512	685	1146	821	1195	3350
North Head, Washington	571	662	654	1659	1934	1785	5452**
North Platte, Nebraska	1118	1004	1173	2364	2459	2486	6366
Oakland, California	528	514	496	1146	1207	1099	3143**
Oklahoma City, Oklahoma	710	604	815	1302	1150	1379	3613
Omaha, Nebraska	1127	1029	1175	2261	2141	2284	6131
Oswego, New York	1184	1060	1138	2367	2077	2494	7088
Parkersburg, West Virginia	913	774	921	1774	1439	1830	4775
Peoria, Illinois	1045	988	1150	2168	1945	2323	6109
Philadelphia, Pennsylvania	905	776	884	1688	1319	1699	4737***
Phoenix, Arizona	432	289	425	698	584	581	1405
Pittsburgh, Pennsylvania	1005	897	967	2035	1672	1949	5235
Pocatello, Idaho	1194	995	1181	2762	2752	2649	6655
Port'and, Maine	1307	1187	1159	2552	2504	2605	7218
Portland, Oregon	622	656	729	1462	1749	1724	4469
Providence, Rhode Island	1041	915	1026	2042	1693	2130	6015
Pueblo, Colorado	981	885	1029	2232	2306	2164	5514
Raleigh, North Carolina	703	543	694	1312	938	1253	3234
Rapid City, South Dakota	1074	1133	1172	2657	2979	2701	7118
Reading, Pennnsylvania	960	860	1001	1864	1562	2014	5389
Red Bluff, California	624	568	1271	1143	1121	3341	(a)
Reno, Nevada	1010	923	973	2445	2506	2284	5892
Richmond, Virginia	793	626	763	1493	1100	1380	3695
Rochester, New York	1186	1069	1125	2390	2084	2414	6732
Roseburg, Oregon	674	697	719	697	1890	1741	4428
Roswell, New Mexico	819	632	808	1545	1306	1510	3484
Sacramento, California	593	587	574	1132	1155	996	2653
St. Joseph, Missouri	944	881	1079	1924	1732	1960	5161
St. Louis, Missouri	811	746	936	1646	1363	1738	4585
Salt Lake City, Utah	1091	908	1020	2369	2425	2149	5555
San Antonio, Texas	376	306	347	629	509	473	1202
San Diego, California	289	246	288	493	507	487	1645
Sandusky, Ohio	1031	947	1063	2074	1743	2142	6208
San Francisco, California	436	424	428	973	1022	949	3264**
Sault Ste. Marie, Michigan	1388	1398	1370	3087	3123	3247	9285**
Savannah, Georgia	400	297	397	643	414	598	1490
Scranton, Pennsylvania	1105	988	1085	2244	1905	2274	6129
Seattle, Washington	612	719	719	1639	1915	1869	4934**
Sheridan, Wyoming	1176	1158	1320	2887	3086	3198	8008
Shreveport, Louisiana	475	353	499	842	636	769	1938
Sioux City, Iowa	1297	1187	1265	2627	2641	2583	6898
Spokane, Washington	1053	1000	1057	2602	2765	2583	6355
Springfield, Illinois	930	873	1039	1873	1687	2002	5373
Springfield, Missouri	820	742	893	1623	1489	1674	4428
Syracuse, New York	1213	1067	1172	2477	2128	2491	6893
Tacoma, Washington	660	747	756	1801	2095	1951	5181**
Terre Haute, Indiana	995	845	992	2019	1556	1840	4872
Toledo, Ohio	1142	1021	1079	2317	1996	2189	6077
Topeka, Kansas	913	828	1008	1788	1657	1883	4969
Trenton, New Jersey	960	842	930	1868	1495	1760	4933
Utica, New York	1325	898	1144	2588	1991	2537	6796
Valentine, Nebraska	1135	1118	1245	2655	2793	2725	7039
Walla Walla, Washington	812	801	896	1839	2108	1909	4808
Washington, D. C.	869	724	896	1617	1250	1741	4626
Wichita, Kansas	890	776	955	1677	1583	1783	4673
Williston, North Dakota	1358	1522	1591	3348	3745	3658	9323
Winnemucca, Nevada	1084	943	1080	2597	2625	2589	6427**
Yakima, Washington	955	965	1091	2242	2633	1091	5599

(a) Data not available.
†Nome data are for November.
*Includes August.
**Includes July and August.
***New 48-year normal covering 1898 to 1946.
[1]Figures in this column are normal totals for a complete heating season, September to June, incl.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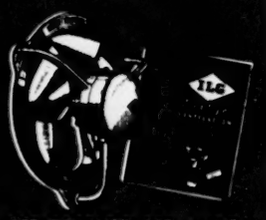

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Abstracts AND Reviews

Publications abstracted in this department should be ordered direct from publisher.

ENGINEERING DATABOOK

A comprehensive volume of reference tables, charts and texts by Clifford Strock, editor, HEATING AND VENTILATING, published under the title of Heating and Ventilating's Engineering Databook. The page size of 8½ x 11 in. enables the use of large easy-to-read type in the tables and text, and permits the reader to make accurate interpretation of large scale graphs and charts.

Data are organized into 10 sections—Heat and Moisture in Air, Fuels and Combustion, Piping, Air Handling and Ventilation, Heating and Heat Transmission, Cooling and Air Conditioning, Motors and Drives, Contract Law, Mathematical Data and Drafting Room Practice, and Terminology.

Purely practical in character, the Engineering Databook is intended for everyday use by heating, ventilating and air conditioning engineers, contractors, architects, plant engineers and engineering students. Instead of being heavy in theory, emphasis is placed on the data needed in actual design with only sufficient text to clarify the use of the data through illustrative problems or explanatory text. The wide coverage of the many topics of interest to engineers in the fields mentioned, makes the book a must for the engineer's reference shelf. The concise, workable data provides answers to many questions that may arise in the engineer's day.

The Databook is as up-to-the-minute as possible; included are workable facts regarding the heat pump, electrothermal storage, snow melting, heating with diesel engines, solar water heating, and radiant or panel heating.

A most useful and unusual feature of the Engineering Databook is the 18-page section devoted to the law of contracts. This section is based on actual higher court decisions which apply specifically to heating, ventilating and air conditioning cases. In this section are discussed: The validity of contracts, implied warranty, technical competence, alteration of plans, extras, subcontracting, substitutions, inconspicuous clauses, guarantees, distinction between employe and contractor, and many other points covered in the law of contracts. Each case used as an example is one in which a heating, ventilating or air conditioning contractor or engineer was involved. In addition, other legal subjects which concern heating men are discussed, such as patent infringement, real estate law, relations with municipalities, mechanic's liens, withdrawal of bids, and costs plus contracts. Particular attention is called to this because of the absence of such material in other compilations of data.

Engineering Databook, by Clifford Strock. Cloth bound, 8½ x 11 in., 576 pages. Published by The Industrial Press, 148 Lafayette St., New York 13, N. Y. Price, $7 postpaid. Canadian and foreign postage, 80 cents additional.

INDUSTRIAL ENVIRONMENT AND ITS CONTROL

A new approach to the factors of industrial environment affecting health and the methods of dealing with them are presented by Dr. J. M. Dalla Valle in his latest book. Basically, it covers engineering methods applicable to the control of health hazards in factories. It presents extensive and critical details regarding dusts, fumes, vapors and gases, and their physiologic effects. Included is an extensive discussion of exhaust ventilation as a means for control of dusts, vapors and fumes, and the design of ventilating systems.

Basic principles are stressed and parallel material that might detract and befuddle was avoided. The text was designed to be of value to ventilating and mechanical engineers and industrial plant managers. Its twelve chapters and appendix cover problems and trends; psychrometry; atmospheric environment; illumination and radiant energy; noise, vibration and fatigue; thermal environment; industrial ventilation; design of local exhaust hoods; design of exhaust systems; measurement of air flow; air sanitation; industrial dust collection.

Dr. Dalla Valle, who was formerly with the U. S. Public Health Service and with the New York State Labor Department, has done considerable laboratory work in the study of transmission of bacteria by ventilating and air conditioning systems.

This book is recommended to those engaged in controlling the factors of industrial environment that have an effect on the welfare and health of workers, and to the engineer who wants a better understanding of this subject.

The Industrial Environment and its Control, by J. M. Dalla Valle. Cloth bound 6 x 9 in., 225 pages. Published by Pitman Publishing Corp., 2 W. 45th St., New York 19, N. Y. Price $4.50.

BUYERS' DIRECTORY

A product directory covering the fields of air conditioning, piping, heating, refrigeration, ventilation and air sanitation is provided in the 1948 edition of the Heating and Ventilating Buyers' Directory. In it

Recognized Dependability

DEPENDABLE...

through years of field proving

Time-tested choice of thousands of manufacturers and engineers since 1940, A-P Model 206 is today one of the industry's top favorites for small tonnage units. Factory set at the desired superheat, it is tamper-proof, and no further field adjustments are necessary — a distinct advantage on many systems. You'll find it on large domestic units, water and beverage coolers, display cases, freezers, air conditioners and similar units.

Like all A-P Expansion Valves, the Model 206 maintains a constant superheat over a wide range of evaporator temperatures, testing less than ½° variation over a range of operating temperatures from minus 30° to 50° F. Popular both as original equipment and as replacement, it is compact, simple to install. Valve body can be mounted in any position or ambient temperature.

NEW MODEL 211 FIXED SUPERHEAT VALVE WITH LIMITING PRESSURE FEATURE

Protects systems against motor overload by limiting operating suction pressure to predetermined setting. May be used in place of any standard fixed superheat valve of similar capacity. Capacity, ½ and 1 ton Freon 12, or Methyl. Types available to limit pressures to 15, 40, and 55 lbs. Freon 12; 10 and 30 lbs. Methyl.

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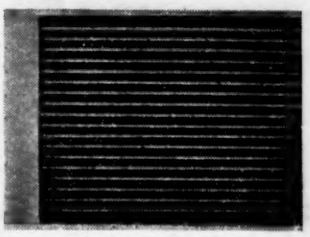
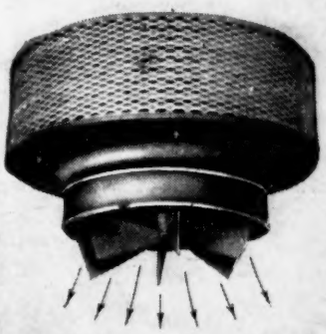


All copper spiral fin tube construction with the tubes formed or bent permits uniform expansion without strain. Headers are heavy wall construction with tubes brazed into extended ferrules formed in the headers. Fins are helically wound and metallically bonded. May we send catalog?

VERTICAL TYPE UNIT HEATERS



A proven heating unit, modern in design, incorporating every unit heater advancement. McCord copper spiral fin tube construction creates air turbulence without undue restriction. Improved fan blades deliver large volume of air with minimum air noise. Guaranteed for 150 lbs. saturated steam pressure. Specify McCord.

HORIZONTAL TYPE UNIT HEATERS

A time proven heating unit, modern streamlined in design, quiet, yet its rugged construction adapts it to all types of installations, guaranteed for use on No. 150 p. s. i. steam pressure. All copper heating element, individual spiral fin tubes free to expand without strain on joints. Standard motors with standard bases used. Wide range of capacities.

Save fuel with McCord Unit Heaters.

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are listed the names of manufacturers of sources of supply of equipment, supplies and services.

Another feature of great value is the trade name section which includes both current and obsolete trade names together with the product with which it is associated and the name of the manufacturer. In the closing section of the book is a separate listing of street addresses of manufacturers.

The directory has 975 heads or sections under which the various products are grouped, to facilitate finding the manufacturers of specific equipment and appliances. This, too, has been simplified by a list to show under which classification specific items can be found.

1948 Heating and Ventilating Buyers' Directory. Heavy paper binding, 5⅝ x 8¼ in., 320 pages. Published by The Industrial Press, 148 Lafayette St., New York 13, N. Y. Price, $1.

INSTRUMENT AND CONTROL MANUAL

Eugene W. F. Feller in preparing this Instrument and Control Manual had as his objective to provide a practical manual for the man in the plant who would require explanations of the basic principles of control and who might have to find quick solutions of specific metering and control problems.

Data is arranged so that the reader will become familiar with the various types of controllers, how they function, and the points to be considered when new equipment is to be selected. The material is presented in a practical way and in an understandable style so that the reader is made familiar with all available types of instruments and controllers and their physical characteristics.

Because of the present size of plants required in process and power work, hand control becomes impractical. It is necessary to have accurate and dependable control of pressures, temperatures, liquid levels, humidity, and other factors. For that reason it is believed that this practical manual may find a ready reception on the part of the plant operator.

Instrument and Control Manual, by Eugene W. F. Feller. Cloth bound, 5½ x 8 in., 426 pages. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y.

• • •

WARM AIR CEILING PANEL SYSTEMS—Design details concerning warm air ceiling panel systems for residential structures having design heat losses not in excess of 120,000 Btu per hour are presented in Manual 7-A of the National Warm Air Conditioning Association, 145 Public Square, Cleveland 14, Ohio. The purpose of the recommendations and tables is to simplify the design of a ceiling warm air panel heating system. The manual presents an outline of calculations and design, sizing of ducts and branches, general instructions, and design details covering the one-story house, two-story structure, ranch type house and other house designs. As the use of this system involves a patented product, licenses must be obtained from the furnace supplier. For a copy of this 36-page book, write to the association. Price, 60 cents. In addition, an illustrated booklet describing the Panelaire or radiant panel warm air heating has been prepared for the consumer. Prepared in a non-technical style, it illustrates and describes the various features of the system. Priced at 25 cents, this booklet may be obtained by writing to the International Heater Co., Utica, N. Y.

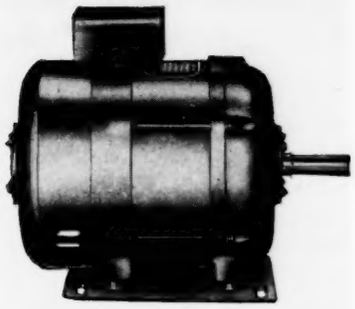
FLAMMABILITY OF METHYL ETHYL KETON VAPOR—Research Bulletin No. 38 of the Underwriters' Laboratories, Inc., covers the Limits of Flammability of Methyl Ethyl Keton Vapor in Air at Initial Temperatures of 100, 150 and 200C. The chemical is a flammable liquid that is used industrially as a solvent. The investigation was made to find data on the lower and upper flammable limits of this vapor at the temperatures stated. For a copy, write to Underwriters' Laboratories, Inc., 207 East Ohio St., Chicago 11, Ill.

WELDING SYMBOLS — The 1947 edition of standard welding symbols covers 34 of the welding processes used in various industries. The society points out that this set of standards is the accruement of 20 years of industrial experience. The Committee on Symbols has adopted a policy which will keep future changes of symbols to a minimum. Price, 50 cents. American Welding Society, 33 W. 39th St., New York 18, N. Y.

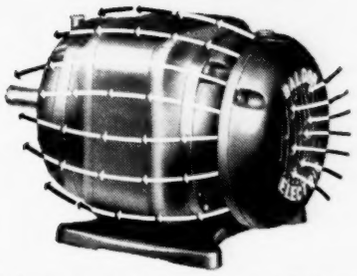
TESTING AND RATING CONVECTORS—The Commodity Standards Division of the National Bureau of Standards has issued Commercial Standards CS140-47 for Testing and Rating Convectors. It covers the methods for testing and rating cast iron and nonferrous steam and hot water convectors used for heating rooms. The development of methods of test by which the complete performance of convectors may be accurately determined in advance of installation will require further investigation and research. Price, 10 cents. Superintendent of Documents, Government Printing Office, Washington 25, D. C.

ALUMINUM FOR AIR DUCTS — Information on the properties of aluminum for ducts to handle air in heating, ventilating and air conditioning work is given in a 32-page booklet to help the engineer in the selection of the proper aluminum alloy. It has data on the fabrication of aluminum sheets, joint design and duct erection. Reynolds Metals Co., Louisville 1, Ky.

BOILERS, EXPANSION TANKS AND SOLAR TANKS—Simplified Practice Recommendation R8-47 issued by the Division of Simplified Practice, National Bureau of Standards is a record of voluntary recommendations of the trade. This is the third revision of the recommendations originally proposed in 1923. Price, 5 cents. U. S. Government Printing Office, Washington 25, D. C.



Open, drip-proof construction; 1/6 to ⅓ h. p., 1 phase, 3 phase and Direct Current.



Arrows indicate forced air-movement over ENTIRE EXTERIOR of BALDOR STREAMCOOLED Motor.

Single Phase, ¾ to 7½ h. p.
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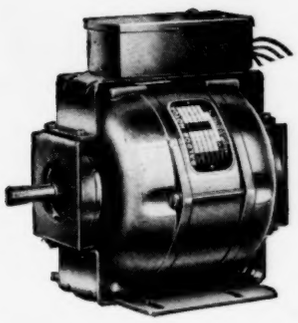
Direct Current, 1 to 3 h. p.

STREAMCOOLED, round frame, ⅓ to ¾ h. p., 1 phase, 3 phase and Direct Current.

BALDOR builds a Complete Line of Motors for HEATING, VENTILATING and AIR CONDITIONING EQUIPMENT

These BALDOR Motors have won national acceptance because of their cool-running, quiet, efficient operation. Many manufacturers in your industry have consistently used them for more than 25 years.



Resilient-mounted, open, drip-proof, for belt drive; 1/10 to ¾ h. p., single phase.

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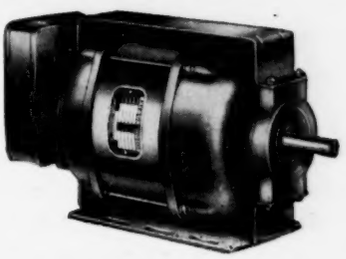
FOR MORE THAN A QUARTER CENTURY



Resilient-mounted fan motor, 1/30 to ½ h. p., 1 phase; ⅛ to ½ h. p., 3 phase.

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Designed to give 100% efficiency.

This new type H S Pump is the result of experience and research of the war years. The H S Condensate and Boiler Feed Pump is very dependable and will operate at a wide range of pressures, handling the condensate requirements very satisfactorily from steam heating systems and process equipment.

Write for Bulletin No. 14 A-H

MANUFACTURERS OF QUALITY PUMPS FOR OVER A QUARTER OF A CENTURY.

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GALVANIC CORROSION OF DISSIMILAR METALS—The Committee on Domestic Gas Research of the American Gas Association has issued Part 1 of its report on Galvanic Corrosion of Dissimilar Metals as Applied to Gas Hot Water Storage Heaters. The study was made at the Case Institute of Technology and the report was prepared by Dr. Robert C. Weast. It is a study of conditions that cause tank failure by corrosion from stray electric currents. This 23-page report may be obtained from the American Gas Association, 420 Lexington Ave., New York 17, for 75 cents.

FUEL-SAVING TIPS—A Guide for reducing Fuel Consumption in Commercial Plants, a 169-page handbook issued as Bulletin 466, is particularly timely at the present moment because of worries over fuel supplies. The book was prepared by J. F. Markley, Chief of the Fuel Utilization Division and the Solid Fuels for War Division, Washington, D. C.; T. C. Cheasley, supervising engineer, and K. M. Waddell, assistant respectively of the National Fuel Efficiency Section during the war. The book, prepared in the form of questions and answers, covers a wide variety of topics. Price, 50 cents. Superintendent of Documents, Government Printing Office, Washington 25, D. C.

HEATING SERVICE GUIDE—This paper bound, pocket size booklet was prepared by K. C. Richmond, editor, Coal-Heat, to show how to meet the common heating complaints and how to gain new business through the proper handling of customers. In its 98 pages are condensed a large amount of information regarding the servicing of coal-burning heating systems, proper firing, heating difficulties, chimney construction, stoker operating suggestions, etc. Price, 50 cents. Coal-Heat, 20 W. Jackson Blvd., Chicago 4, Ill.

PLUMBING FIXTURE FITTINGS—Recommendations for simplified practice recommendations R227-47 for Plumbing Fixture Fittings and Trim for Housing covers a simplified list of sizes and varieties in the industry. The start for this project was basically established during the war years. Recommendations shown in this booklet are proposed by the Sanitary Brass Institute and the Tubular Plumbing Goods Institute. Price, 5 cents a copy. Write to the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

GAS FACTS — The American Gas Association has published *Gas Facts*, a statistical year book to be published annually. The first edition gives a statistical record of the gas utility industry for 1945 and 1946. This 166-page paper bound book is divided into 9 sections and covers a review of 1945 and 1946, energy reserve, production, transmission and distribution, sales and utilization, finance, labor, prices and time series by gas types. All original information is based on data reported to the association in its Annual Report of Gas Operations. Price, $1. Bureau of Statistics, American Gas Association, 420 Lexington Ave., New York 17.

EXHAUST CODE

(News item continued from page 124)

mentals Relating to the Design and Operation of Exhaust Systems, published in 1936, and to revise it if necessary in the light of developments in that field since the original report was prepared.

A subcommittee under the chairmanship of Arthur C. Stern, of the American Society of Mechanical Engineers, will prepare a list of operations for which exhaust ventilation should be recommended.

• **COORDINATE.**—A third subcommittee appointed at the meeting is headed by William B. Harris of the American Conference of Governmental Industrial Hygienists. It will study present activities of other groups interested in the field of exhaust ventilation and will report to the sectional committee.

RADIANT HEAT

sells itself on comfort and convenience according to Washington, D. C. survey.

An attempt to determine what the housewife who lives in a radiant heated house thinks of her heating system was made by Robert J. Lewis, real estate editor of the *Washington Star*, in a house to house canvas. Mr. Lewis chose for his survey a housing development in Landover, Md., where 136 radiant heated houses have been completed and occupied.

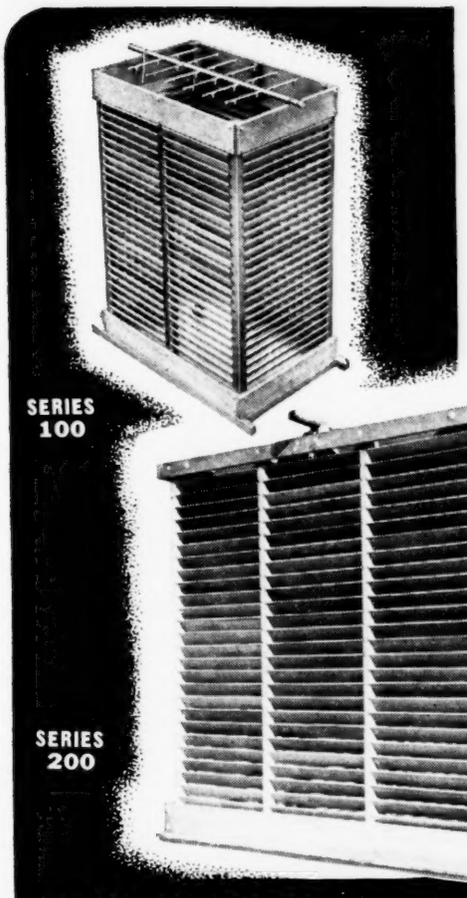
• **PERFORMANCE.**—All housewives interwiewed in the door-to-door survey liked radiant heat better than other types of heat with which they were familiar. While they had no conclusive figures on costs, they were enthusiastic about performance of the systems.

Installations in this development, known as Radiant Valley, are gas-fired. A gas furnace is located in a small utility room in each of the one-floor, two-bedroom, brick veneer houses. The floor area is a concrete slab in which steel pipe coils are embedded.

The superior comfort of warm floors was the chief advantage of radiant heat mentioned in each interview. Most residents set their thermostats at 70F for daytime and about 68F at night. One woman reported a 60F night setting but said it has been taking the system about three hours to bring up the temperature in the morning to 70F.

• **COSTS.**—December gas bills, for heating and cooking combined, averaged from $22.50 to $25. December degree days for the Washington area were 869. November bills ran $13 to $16 with 588 degree days.

• An *electronic temperature control* for street cars, first of its kind to be developed, will be installed on the 100 new cars of the Pittsburgh Railway Company. The controls were developed especially for the cars now being built by the St. Louis Car Company, according to a Minneapolis-Honeywell announcement.



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Marley Atmospheric Spray towers are doubly economical: economical to install, economical to operate *efficiently* . . . because, regardless of price, every Marley tower is engineered for efficiency. Only years of experience and constant study can produce towers with these qualities so vital to efficient atmospheric water cooling:

- **Most complete utilization of natural air flow.**
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- **Sturdy structural strength without excess usage of material.**

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SERIES 200 TOWERS—Built in standardized sections for variable capacities. Standard coils are available for closed system cooling. Both towers are prefabricated for ease of erection.

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Marley Non-Clog Spray Nozzles set the standard in process industries for product and container washing, humidifying, cleaning, air washing, homogenizing and other services.

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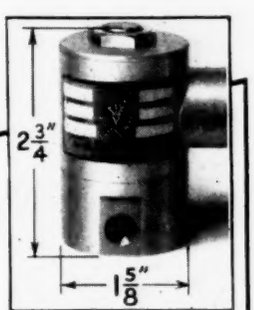

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TWO WAY - NORMALLY CLOSED
TWO WAY - NORMALLY OPEN

The extremely compact design of Skinner Electric Solenoid Valves results in controls of small size and unusual capacity. They are built to fit into product designs where positive, accurate flow-control of practically any liquid or gaseous media is required. The specifications will show where and how you can use Skinner Valves profitably.

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★ Impregnated coils withstand moisture and condensation
★ Soft insert seats prevent leakage
★ Spring loaded for positive action
★ Stainless steel parts highly resistant to corrosion and wear
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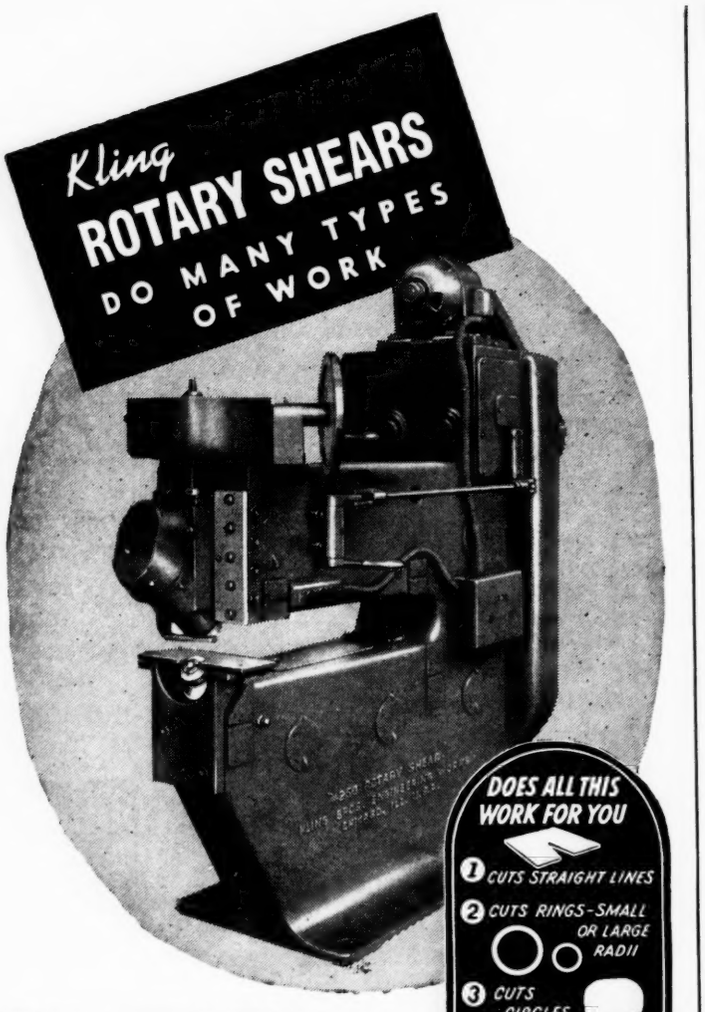
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Rapid operation . . . Hairline Accuracy . . . the use of Kling Rotary Shears marks the latest development in cutting mild steel, and sheet metal, up to 1-inch with amazing savings in time, labor, and production costs.

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which will give you specific facts, and specifications. No obligation involved. Users of heavy equipment of Kling Rotary Shears' class will receive a copy of this Bulletin promptly, on request.

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NEW CATALOGS

Axiflo Fans

An 8-page color booklet, B-3804, describes performance of the new line of Westinghouse Axiflo fans suitable for high temperature applications. Complete with pictures of the various models available in either the elbow or straight-through type, the booklet describes how the unique cone arrangement and other features including low maintenance and ease of installation make these positive pressure fans suitable for such applications as air conditioning systems, heating and ventilating, dust and fume removal, equipment and machinery cooling, heat treating nonferrous metals, and industrial drying and processing. —*Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.* 17

Water Columns and Gages

Bulletins WG-1811, 20-pages, two-colors, describes the Yarway line of water columns and gages including the new tables on column and gage units for pressures above 400 pounds.—*Yarnall-Waring Co., Philadelphia 18, Pa.* 18

Indoor-Outdoor Controls

A series of folders, data sheets, and installation diagrams describes the new White-Rodgers indoor-outdoor control. This control is designed for radiant panel systems as well as conventional hot water heating systems. The control has a hydraulic action. Literature shows types available, adjustments, operation, and installation procedure.—*White-Rodgers Electric Co., 1209 Cass Ave., St. Louis 6, Mo.* 19

Heating Coils

A broad range of types, sizes, and models of a new line of heating coils is described in catalog No. 348, two colors, 48 pages. Performance, selection, and installation data are included. Coils are of copper and copper alloy throughout.—*Modine Manufacturing Co., Racine, Wis.* 20

Refrigerating Machines

Ice and Frost is the title of Bulletin No. 100-D in which the Frick line of "New Eclipse" refrigerating machines is described and illustrated with sizes, capacities, controls and installation data.—*Frick Co., Inc., Waynesboro, Pa.* 21

Refrigeration Accessories

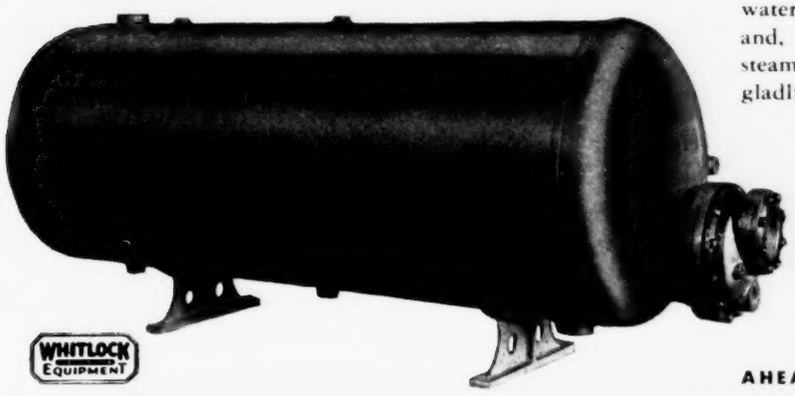
A wide range of refrigeration valves, fittings, driers, filters, floats, charging and testing equipment, tubing tools and welding and soldering equipment are described in a 36-page catalog.—*The Imperial Brass Mfg. Co., 1200 West Harrison St., Chicago 7, Ill.* 22

WHITLOCK PLASTICIZED STORAGE WATER HEATER

✓PROVEN IN THE LABORATORY ✓PROVEN ON THE JOB

Outstandingly successful as a protective device, plastic coating is greatly extending the life of the WHITLOCK Type K steel shell water heater. When applied in accordance with W.M. technique, the plastic coating is proving the practical solution of corrosion problems because of its low cost, ability to permeate all areas, resistance to chipping, and the complete protection it offers from rusting. Scores of installations — with no apparent deterioration of steel or coating — are now corroborating rigorous accelerated tests originally conducted in the WHITLOCK Laboratory.

The WHITLOCK Type K Heater provides ample hot water at all times — utilizes exhaust steam or hot drips, and, where exhaust steam is not available, uses live steam under thermostatic control. Our engineers will gladly make recommendations. Write for information.



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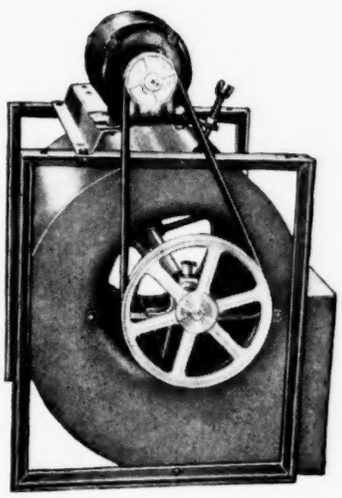

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The new Room Thermostat is designed for pleasing proportions, smaller size, and unobtrusive appearance. Redesign of the operating elements, detents, adjusting mechanism, and contacts produces a more accurate, more sensitive, more durable control instrument. New cases also appear on the Microtherms, with corresponding improvements.

Shown here is the new Barber-Colman Room Thermostat. Case dimensions are 2" wide, 4" high, 1½" deep.

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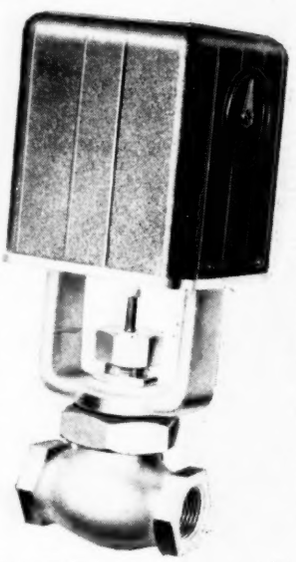
Complete new design of the operating mechanism and housing is featured in the most popular sizes of Motor-Operated Valves. The cover is now metal, with a durable black crinkle finish. An indicating pointer on the outside of the case shows at a glance whether the valve is open or closed. Various carefully-engineered changes in the motor, reduction gear train, switch contacts, and other components combine to produce better motor-operated valves.



New Barber-Colman Motor-Operated Valve. The new design results in a better-looking, smaller, more compact unit.

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Weather-Man Wiring Diagrams

A complete set of wiring diagrams for the weatherman, an "outside-type" building temperature control, shows how to wire the Weatherman for the direct control of stokers, gas burners, oil burners, circulating pumps or zone control valves.—*Automatic Devices Co., 53 W. Jackson Blvd., Chicago, Ill.* 23

Steam Trap Selector

"Selecting the Right Type of Steam Trap" is the title of a four page, 2-color bulletin. An illustrated chart permits the reader to select the right type of steam trap for his particular application. The special features, advantages, and recommendations are listed for each type of trap. Large, cross-sectional illustrations make it simple to follow the text. — *Sarco Co., Inc., Empire State Bldg., New York 1, N. Y.* 24

Welding Fittings Data

Taylor Forge Bulletin 476, *Stainless Steel Dimensional Data,* describes welding fittings from three-quarter inch to 12 inches, and light-weight American Standard flanges from three-quarter inch to 30 inches, all available in stainless types 304, 316 and 347, monel, inconel, nickel, copper and other unusual industrial metals.—*Taylor Forge & Pipe Works, P. O. Box 485, Chicago 90, Ill.* 25

Indicating Controllers

A 7-page catalog, No. ND44(3) is offered as a complete guide to all Model C Micromax indicating controllers. The publication lists specifications in tabular form for potentionmeters, Wheatstone bridges, temperature indicators, etc.—*Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.* 26

Ball Bearings

Jack & Heintz Bearing Division has published a new ball bearing catalog, No. 2001, which includes a pictorial section devoted to the J & H precision ball bearing production methods. Millimeter equivalents, bearing specifications and bearing equivalents are also included as well as a chart explaining the standard AFBMA Bearing Numbering Code.—*Jack & Heintz Precision Industries, Inc., Cleveland 1, Ohio.* 27

Arc Welders

A new 36-page, 3-color catalog contains illustrations, descriptions, dimensions and specifications on simplified arc welders and includes electric motor driven DC welders in five sizes from 150 to 600 amperes; gasoline engine driven welders in four sizes from 200 to 600 amperes; AC transformer type welders in three sizes from 200 to 500 amperes; welding generators only in four sizes from 150 to 400 amperes; gasoline engine driven welders with auxiliary AC or DC power generators; and other models in all sizes for special arc welding applications. — *The Hobart Brothers Co., Troy, Ohio.* 28

Timing Devices

A new 16-page, two-color catalog on synchronous timing motors, timing devices, and clock movements presents photographs, profile drawings and listings of speeds, voltages, frequencies, shaft sizes, and other variations available in each motor.—*Haydon Manufacturing Co., Inc., Torrington, Conn.* 29

High-Pressure Valves

A new Edward catalog section, No. 12-G6, describes forged steel chrome-molybdenum Intex and Univalves. Univalves are welded bonnet integral seat valves for service at 1500 and 2500 lb at 1000F. Intex valves are bolted bonnet integral seat valves rated at 1500 lb, 1000F.—*Edward Valves, Inc., E. Chicago, Ind.* 30

Welding Products

A 12-page catalog lists Tweco accessories for welding equipment including electrode holders, cable connectors, ground clamps, cable splicers, machine terminals, and cable lugs. Quantity, price, and operation information is also included.—*Tweco Products Company, Wichita 1, Kansas.* 31

Fluid-Handling Valves

A comprehensive, 52-page catalog, No. 301, describes valves for industrial hydraulics and fluid handling. This catalog lists engineering specifications and application data—with illustrations—for all types of globe, needle, check, relief and plug valves manufactured by Parker. An additional section treats other specialized valves and accessories for power applications and instrumentation.—*The Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, O.* 32

Steam Control Equipment

A 4-page bulletin features pressure regulators, temperature regulators, strainers and steam traps and includes application and engineering tables. — *O. C. Keckley Co., 400 W. Madison St., Chicago 6, Ill.* 33

FEBRUARY, 1948

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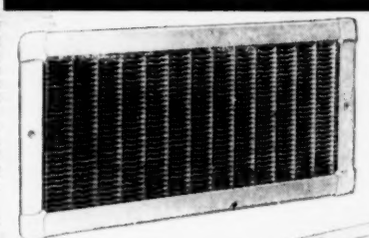

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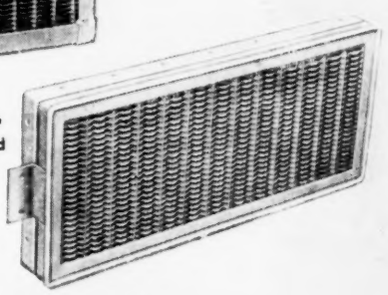

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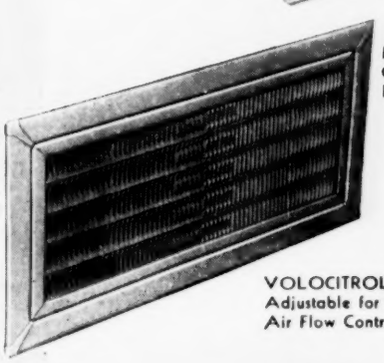

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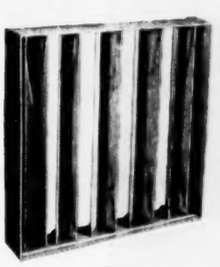

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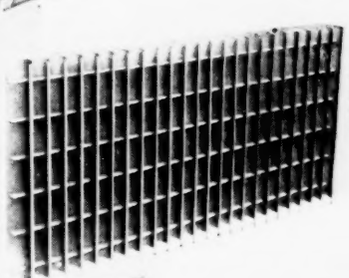

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Simple to operate, easy to carry, set up, and shift from job to job . . . lets you bend pipe exactly where and when you want it. With a GREENLEE, *one man* makes smooth, accurate, uniform bends in a few minutes. You save greatly through elimination of many manufactured bends and fittings. And, in timesavings alone, the GREENLEE pays for itself quickly.

Ideal for radiant heating jobs, too. For complete details write for free folder S-121. Greenlee Tool Co., Division of Greenlee Bros. & Co., 2322 Twelfth Street, Rockford, Illinois.

TOOLS FOR CRAFTSMEN

GREENLEE

Getting Personal

P. E. Brandt

Paul E. Brandt (*Aluminum Pipe and Tubing*, page 83) was born and raised in Waterloo, Iowa and attended Iowa State College. After graduating in 1943 with the degree Bachelor of Science in Aeronautical Engineering, he served as an Engineering officer in the Naval Air Corps until January 1946. During the succeeding year he did stress analysis as well as preliminary design of personal aircraft for the Culver Aircraft Corp. Since February 1947, Mr. Brandt has been with the Sales Division of Reynolds Metals Co. as a technical service engineer. Here he is called upon to design and develop aluminum products for the company as well as for their manufacturing accounts. As a technical engineer he also advises manufacturers on the proper application of aluminum alloys to their respective products.

E. J. Weiss

Edward J. Weiss (*Practical Suggestions covering the Design and Installation of Industrial Exhaust Systems*, page 77) graduated from the Rensselaer Polytechnic Institute in 1934. Before 1937 he was employed as a construction engineer. In 1937 he went with General Electric Co. as the assistant industrial air conditioning engineer of their Schenectady Plant. In 1942 he was placed on Special assignments and subsequently became an assistant general foreman and then a member of the works manager's staff. In 1944 he was sent to Syracuse to supervise most of the plant engineering work required to convert their plant from manufacturing turbines to the manufacture of jet propulsion engines. Since 1945 he has been a project engineer with the American Locomotive Co. He is a licensed professional engineer and a member of the ASHVE and NSPE.

T. F. Dwyer

Thomas F. Dwyer (*Heating and Ventilating for School Buildings*, page 69) has spent thirty years with the Board of Education, New York City.

He received a B.S. degree from City College, New York City, and certificates in architectural engineering and design of mechanical equipment of buildings from the School of Technology, City College evening school.

After several years in the building industry manufacturing field, and in the design and operation of water supply pumping stations, he entered the service of the Board of Education, New York City, as a mechanical draftsman in the Bureau of Construction. Through various promotions he was advanced to mechanical engineer in charge of the drafting room of the Heating and Ventilating Division and in 1936 he was appointed chief of that division, in charge of the design, planning and installation of the heating, ventilating and mechanical equipment of new school buildings.

INDUSTRIAL DEGREE-DAYS

December, 1947

City	55F Base	45F Base
Baltimore, Md.	555	256
Buffalo, N. Y.	825	515
Chicago, Ill.	705	395
Cleveland, Ohio	730	420
Detroit, Mich.	807	497
Indianapolis, Ind.	660	365
New York, N. Y.	653	347
Philadelphia, Pa.	595	290
Pittsburgh, Pa.	695	393
St. Louis, Mo.	501	231

CANADIAN DEGREE-DAYS FOR DECEMBER 1947*

City	December 1947	December Normal	Cumulative, Sept. 1 to Dec. 31 1947	Cumulative, Sept. 1 to Dec. 31 Normal
Calgary, Alta.	1308	1426	3653	3702
Charlottetown, P.E.I.	1290	1246	2816	2865
Crescent Valley, B. C.	1094	1240	2918	3279
Edmonton, Alta.	1463	1578	3882	3984
Fort William, Ont.	1634	1596	3734	3815
Grande Prairie, Alta.	1519	1649	3967	4159
Halifax, N. W.	1167	1138	2449	2615
London, Ont.	1265	1200	2646	2677
Medicine Hat, Alta.	1314	1417	3365	3389
Moncton, N. B.	1410	1373	3037	3186
Montreal, P. Q.	1496	1407	3008	3096
North Bay, Ont.	1624	1528	3445	3503
Ottawa, Ont.	1547	1494	3108	3277
Penticton, B. C.	961	1073	2467	2626
Porquis Junction, Ont.	1786	1786	3899	4248
Prince George, B. C.	1218	1504	3509	3757
Quebec City, P. Q.	1531	1534	3164	3511
Regina, Sask.	1782	1779	4247	4336
St. John, N. B.	1308	1271	2742	2969
Saskatoon, Sask.	1801	1767	4261	4249
Toronto, Ont.	1162	1108	2386	2243
Vancouver, B. C.	778	818	2163	2168
Victoria, B. C.	682	738	1919	1910
Windsor, Ont.	1159	1172	2316	2446
Winnipeg, Man.	1872	1829	4086	4205

*These data are supplied through the courtesy of the Meteorological Division, Air Services Branch, Department of Transport, Canada, with the cooperation of N. W. Etter, Heating Engineer, Enamel & Heating Products Limited, Sackville, N. B.

The Department reports a slight revision in figures for November as published in last month's issue. Corrected figures are: Charlottetown, P.E.I., 814; Grande Prairie, Alta., 1245.

. . . Since the Last Issue

Announcement is made of the establishment of **The Demuth Co.**, 509 Fifth Ave., New York City, as manufacturers' agents in the metropolitan area for the heating and ventilating trade. Current accounts are with William S. Haines & Co., Philadelphia, Pa., Tenney Engineering Co., Newark, N. J., American Foundry & Furnace Co., Bloomington, Ill. **Herbert Demuth**, founder of the company, was formerly a partner in Charles Demuth & Sons.

The Washington, D. C. office of the **Marlo Coil Co.** of St. Louis has recently moved to a new and more convenient location. The new office under the management of Mr. H. R. Iverson is located in the DuPont Building, Connecticut Avenue and DuPont Circle.

SHAFCO SUSPENDED OIL-FIRED UNIT HEATERS

"Up in the Air and Out of the Way"

WANT to cut new construction costs? Want to "add" 50, 100, even 200 feet of floor space to existing facilities? Then best you get acquainted with SHAFCO Suspended Oil-Fired Unit Heaters. They "hang" overhead . . . up in the air and out of the way . . . leaving space below free for useful, profitable occupation. And talk about heating efficiency! SHAFCO is tops! . . . 85% by actual tests . . . due to its exclusive, patented "counterflow" principle of air and heat. Installation? Quick and easy . . . because SHAFCO Heaters are compactly designed, simply assembled. Built-in plenum chamber eliminates makeshift "on-the-job" finishing. Heavy duty blower unit assures efficient heat circulation with minimum duct-work. Long-lasting? You bet! SHAFCO maintains the highest standard of quality throughout . . . with heavy gauge steel construction that really stands up under heat. No strains, no warping, no buckling! And SHAFCO Heaters have been thoroughly proved in use over 10 years successful application by major oil companies.

Models available from 100,000 to 400,000 B.T.U. to meet heating requirements of a wide range of commercial and industrial installations. Write today for the complete SHAFCO story.

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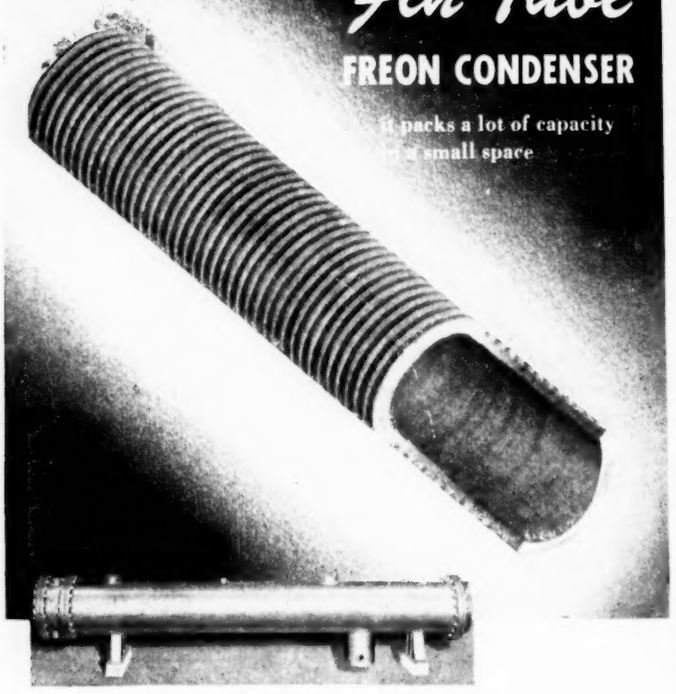
It packs a lot of capacity
in small space



With the fin type of copper tube, approximately 50% extra capacity is provided for any given shell size and tube arrangement over prime surface tube construction. Thus, the buyer of this latest design Patterson-Kelley Freon Condenser can figure on less building space and lower investment cost for his requirements than if he orders a prime surface tube condenser.

For many years, Patterson-Kelley engineers have been specializing in the design and construction of heat transfer equipment, including all types of Freon and other cooling systems. Perhaps with our engineering experience and manufacturing facilities, we can be of service to you in connection with Condensers, Coolers, Heat Exchangers, and other units for your air conditioning or refrigeration systems.

THE PATTERSON-KELLEY Company, Inc.
122 WARREN STREET, EAST STROUDSBURG, PA.
NEW YORK 17—101 Park Ave. PHILADELPHIA 3—1700 Walnut St.
CHICAGO 4—Railway Exch. Bldg. BOSTON 16—96-A Huntington Ave.
Representatives in Principal Cities

Roy C. Yantis joined the **Henry Valve Co.** of Chicago as assistant sales manager on November 24, 1947, succeeding George W. Wilson, who resigned. Mr. Yantis has been associated with Frigidaire and Gibson Refrigerator Co. and was chief refrigeration engineer for Wolverine Tube Division of Detroit, prior to joining the Henry organization.

Lewis Hamlin, vice-president in charge of plant operations at **Redmond Co., Inc.**, manufacturer of electric motors at Owosso, Mich., has been named executive vice-president. Mr. Hamlin joined the Redmond organization in 1936, having left the experimental department at Marvel Carburetor Co. His work at Redmond has taken him from salvage supervision to chief inspector, then plant superintendent and production manager, after which he was appointed vice-president. **Ralph Redmond**, vice-president and treasurer of Redmond, has been appointed director of sales. Mr. Redmond has been with the Redmond organization since 1925. After serving as office manager and purchasing agent, he became director of purchases. In 1944, he was named vice-president and treasurer, which position he retains with his transfer from director of purchases to director of sales. **Ned Sebring** has been appointed director of purchasing to succeed Mr. Redmond. Mr. Sebring joined the company in 1932 and served during the ensuing years as supervisor in the shipping, receiving, stock, material control and planning departments. In 1939, he was named assistant to the director of purchasing which position he has held until this latest appointment.

L. Hamlin

Ben H. Sachs, Jr., Louisville, has joined Helburn Engineering, Cincinnati representative for **American Air Filter Co., Inc.**, Louisville. He has been with AAF since 1946 and will represent the air filter, dust control, and engine and compressor divisions. Prior to joining the company, Mr. Sachs served three years in the Navy as engineer and repair officer and was graduated from the University of Louisville in 1943 with a B.M.E. Degree.

H. S. Marshall, president of the **C. A. Dunham Co.**, Chicago, has announced that a group of Chicago businessmen, including members of the Dunham Operating & Sales Organization, have purchased the interests in the company formerly owned by the estate of the late C. A. Dunham. Mr. Dunham, founder of the company, had been inactive in the business due to ill health since 1944. Mr. Marshall, who has been president of the company for the past two years and who was executive vice-president prior to that time, adds that no changes in personnel or policy will result from the sale or are to be anticipated. Founded in 1903, the Dunham executive offices are now located in the Chicago Daily News Building, 400 West Madison St., Chicago 6, Ill., and plants are located in Marshalltown, Iowa; Michigan City, Indiana; Toronto, Canada and London, England. The company engineers and manufactures brass specialties, heat control equipment, condensation and vacuum pumps, convector radiation, unit heaters, traps and valves and, during 1947, has added baseboard convectors and power ventilating equipment.

Appointment of two regional sales managers is announced by **McQuay, Inc.**, Minneapolis, manufacturers of air conditioning and refrigeration equipment. The new managers are **C. L. Bensen** and **E. V. Nelson.** Mr. Bensen will cover the central region and Mr. Nelson will cover the west. The eastern sales division was previously assigned in November to C. T. Bappler.

The appointment of **Harry S. Ivins** as Washington, D. C. representative of **Warren Webster & Co.**, heating equipment manufacturers, Camden, N. J., has been announced. Mr. Ivins succeeds S. E. Vance, who has retired after 30 years of service with the company. Mr. Ivins has had more than 15 years of experience in the engineering, sales and service departments at the Webster factory and home office. He lives with his wife and daughter at 1501 S. Nelson Street, Arlington, Va.

Airtherm Manufacturing Co., St. Louis, producers of oil and gas fired heaters, convector radiators, and steam unit heaters, has announced the recent appointment of the following district representatives: **Morton McI. Dukehart & Co.**, Baltimore, for the State of Maryland and District of Columbia; **Wm. H. Dwyer, Jr. & Co.**, Indianapolis, for western and southern portion of Indiana and State of Kentucky; **Pacific Electric Sales Co.**, Port'and, for Oregon, Washington, Idaho and western Montana; **Pacific Engineering Equipment Co.**, San Fernando, for California, Arizona and Nevada; **Rittelmeyer & Co.**, Atlanta, for the State of Georgia; **Bernard A. Thomas**, Tampa, for the State of Florida.

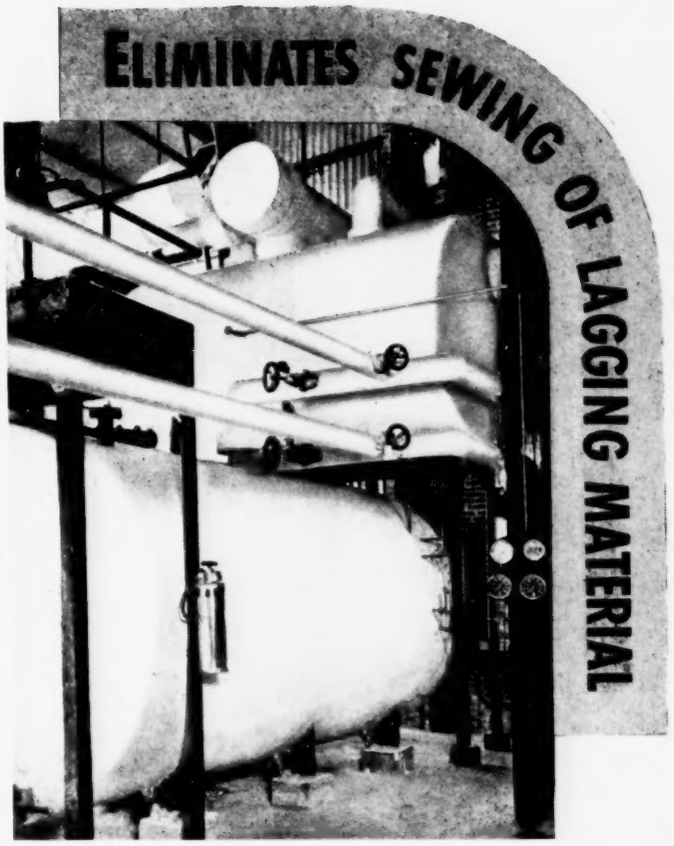
R. E. Larson, sales manager, Wolverine Brass Works, Grand Rapids, Michigan, was elected chairman of the **Sanitary Brass Institute** at the annual meeting of the SBI. **J. S. Hinkley** of Dick Bros., Inc., Reading, Pa., was elected vice-president and **Paul Kreuzer** of the Royal Brass Mfg. Co., Cleveland, Ohio was re-elected treasurer. **R. K. Hanson** of Pittsburgh, Pa. is secretary.

Irvin A. Eubanks has been named to head the newly created post of supervisor of information at the **Airtemp Division of Chrysler Corp.** Mr. Eubanks, a former newspaperman, joined Airtemp, August 12, 1946, as editor of **Chrysler Airtemp News.** The publishing of the dealer and employe magazines will remain under his supervision and in addition he will have charge of all information activities of the division.

W. C. Newberg has been appointed president of the **Airtemp Division of Chrysler Corp.** to succeed D. W. Russell who is retiring from this position after serving as president of Airtemp for eight years. Mr. Newberg has been associated with Chrysler Corp. for more than fourteen years. He entered the company as a student in the Chrysler Institute of Engineering from which he received his master's degree in mechanical engineering in 1935. For the next seven years he served in various engineering and executive capacities until he was made chief engineer of the Dodge-Chicago plant in 1942. The entire engineering activities of the operation were under his supervision. From the end of the war to the present time he has been serving on the staff of C. L. Jacobson and has spent almost his entire time working with the different departments at Airtemp.

W. C. Newberg

The appointment of **Wm. H. Wise** as branch manager of the Chicago office was announced recently by **Bryant Heater Co.**, Cleveland, Ohio. Mr. Wise was formerly manager of domestic sales for the Peoples Gas, Light and Coke Co. of Chicago. Mr. Wise replaces C. O. Frary, former Bryant Chicago manager, who has retired after thirty years of service with Bryant Heater Company.



Insulation on pipes, ducts and boilers must be protected by lagging material. But you need no longer spend the time or the money to have this material sewn . . . not when Arabol Lagging Adhesive is used.

This adhesive holds the canvas, asbestos, fiberglas or other covering firmly in place; dries in 4 to 6 hours; *leaves a sized finish.* The lagging material is neat-looking and fully protected—without the use of paint. (You can always add one coat for appearance, if you so desire.)

Maintenance is simplified—grease, oil, soot and dirt wash off easily. And the adhesive is vermin-proof . . . fire-retardant, too.

Arabol Lagging Adhesive has successfully passed rigorous tests by independent laboratories. The results show that it retains its adhesive powers despite exposure to extreme temperatures, to immersion in water, and to live steam.

Write us today for detailed facts and figures. Don't place open specifications on lagging work — insist on Arabol Lagging Adhesive. You can depend on it to fill your most exacting requirements for both utility and appearance. Also, ask about our cork cement for adhering cork to cork on refrigerator lines.

THE ARABOL MANUFACTURING CO.

Executive Offices: **110 East 42nd St., New York 17, N. Y.**

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SAN FRANCISCO—1950 16th St.
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Branches in Principal Cities
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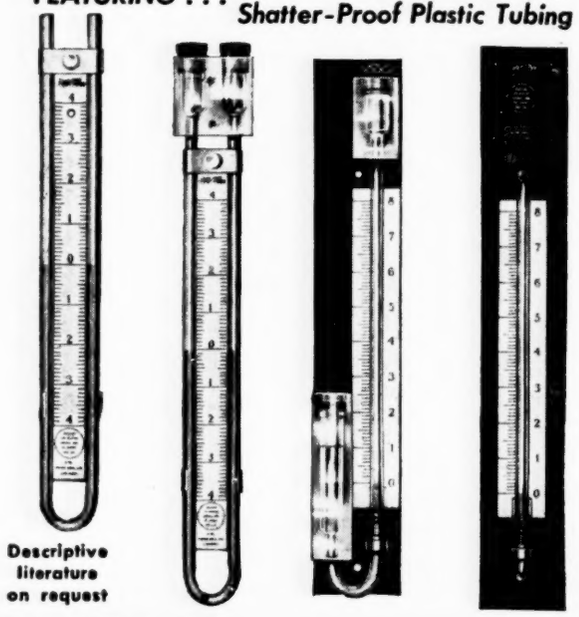
Adhesives?... ARABOL!

New!

DWYER FLEX-TUBE MANOMETERS

FEATURING . . . Over Pressure Safety Trap
Shatter-Proof Plastic Tubing



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309 South Western Avenue, Chicago 12, Illinois

FOR LESS COST AND MORE STEAM

always specify

THERM-O-TILE

Reg. U. S. Pat. Off.

Underground Pipe Conduit

The COST of heat transfer is usually the IMPORTANT item, year in year out. That's why habitually careful heating engineers, after thorough investigation, consistently specify THERM-O-TILE.

THERM-O-TILE definitely costs less in the end, regardless of first cost. It is *permanent*. No sagging. No rotting. No rusting. Insulation is always dry. Besides, it is actually *competitive* in first cost. Users of THERM-O-TILE therefore get *much more* for every dollar invested.

Sold and installed by Johns-Manville Construction Units in all principal cities.

THERM-O-TILE is completely illustrated and described in Bulletin 381. Ask for a copy.

H. W. PORTER & CO., Inc.

823-V Frelinghuysen Ave. Newark 5, N. J.

The Herman Nelson Corp., Moline, Illinois, announces the following changes in its field organization: A new branch sales office has been opened in Springfield, Mass., under the direction of **Philip A. Boulton** who has recently been working out of the Boston office. **Frederick M. Hewitt** has been transferred from Washington, D. C., to take charge of a new office in Baltimore, Md. Both offices will handle sales of the company's line of unit heaters, unit ventilators, propeller fans, unit blowers and centrifugal fans. **Richard K. Hunter & Co.**, Greensboro, N. C., has been appointed product application engineer covering North and South Carolina. **Appleton Engineering** is now representing the firm in the Denver, Colorado, sales area. J. M. Appleton was a Herman Nelson product application engineer from 1923 to 1941. During the war he was active in ordnance engineering. **D. R. Rippey,** product application engineer in Houston, Texas, has been assigned additional sales territory in the San Antonio area. The staff of the Philadelphia branch office has been increased by the addition of **W. Donald Strause** as product application engineer. Now associated with the Cleveland branch office, is **W. B. Polhemus.** The Cincinnati branch office has been moved to Room 1107 Enquirer Building, 617 Vine St., from its old location in the Temple Bar Building.

Edward M. Smith has been appointed manager of the Chicago branch office for **Penn Electric Switch Co.** of Goshen, Indiana, to succeed W. W. Lige, resigned. Mr. Smith has been a sales engineer with the Penn organization for the past 10 years, and during the last 2½ years, he was manager of the company's Goshen territory. Previously, he had been manager of Penn's Detroit branch office for approximately 5 years. The Chicago office of Penn Electric will remain in its present location at 520 N. Michigan Avenue.

The **Brown Instrument Co.** has expanded sales and service activities in the Rocky Mountain area by establishing permanent sales and service representation at 400 Broadway, Denver, Colo., and 437 Atlas Building, Salt Lake City, Utah, it was announced by the industrial division of **Minneapolis-Honeywell Regulator Co. Donald Larcen** has been placed in charge of Denver industrial sales and **George Winslow,** formerly industrial service manager at Detroit, will handle similar duties in Salt Lake City, where he will work with Eldon Richardson, district manager.

Frank J. Nugent, who, since March, 1944, has been general manager of appliance sales for Rheem Manufacturing Co., has accepted the position of sales promotion manager of **Bryant Heater Co.**, Cleveland, Ohio. Mr. Nugent, who joined Bryant, January 1st, is first vice-president of the Gas Appliance Manufacturers' Association and chairman of the water heater section of that organization. He is also vice-chairman of the electric water heater section of the National Electrical Manufacturers' Association. Prior to joining Rheem in 1939, Mr. Nugent had been associated with Koppel Car and Equipment Manufacturing Co., the Blaw Knox Co. and the Pittsburgh Water Heater Sales Co. He attended Duquesne University and Carnegie Institute of Technology.

F. J. Nugent

Modine Manufacturing Co. announces the appointment of **John A. Sandberg** as sales representative in the company's Moline, Illinois territory. His appointment became effective January 1. Mr. Sandberg can be reached at Box 208 in Moline.

General Electric has purchased a plant in Bowling Green, Ky., to be devoted entirely to the production of water coolers, G. R. Prout, vice-president and general manager of the G. E. Air Conditioning Department, has announced.

Howard E. Degler has been appointed technical director of **The Marley Co.**, manufacturers of water cooling towers and other water cooling equipment. Mr. Degler has been professor of mechanical engineering at the University of Texas since 1930 except for one year spent in England with the Army Information and Education Service. He headed the university department for 15 years. He also taught for eight years at the University of Illinois and prior to that time was a design engineer for oil and power companies. He received his mechanical engineering degree from Lehigh University in 1914 and his master's degree from the University of Illinois in 1927. Mr. Degler has written and co-authored several textbooks on gas, oil, and steam power.

H. E. Degler

General Controls Co., announces the appointment of **Don S. Bentley** as factory branch manager of the company's Los Angeles branch. Mr. Bentley will cover the following states: Southern California, Arizona, sections of Nevada, New Mexico and Texas. **F. E. Weldon** has been appointed factory branch manager of the general controls, New York office, 101 Park Avenue, N. Y. Mr. Weldon has been with the company in the capacity of A. G. A. representative in Cleveland, Ohio, and will serve users of automatic controls in New York state, New Jersey and Connecticut. **C. G. McCarthy** has been appointed Detroit factory branch manager. The Detroit branch serves users of automatic pressure, temperature and flow controls in Michigan, sections of Ohio and Canada.

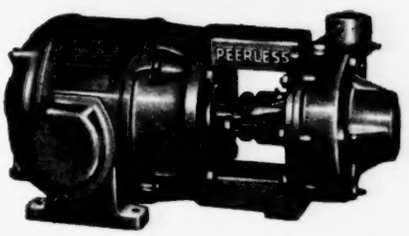
In order to properly handle a greatly increased volume of sales in the automatic control field, **Hammel-Dahl Co.**, Providence, R. I., has been incorporated, effective January 1, 1948. Plant output will be increased with the addition of plant facilities. There will be no change in the management of the company. The following men comprise the officers and board of directors: **E. T. Dahl**, president; **B. G. Woolley**, treasurer; **Bruce A. Irwin**, vice-president and secretary; **Thomas Ponton**, vice-president.

Dravo Corp. of Pittsburgh, Pa., announces the appointment of **William H. Collins** as director of advertising. Mr. Collins comes to Dravo Corp., from the Scott Paper Co. of Chester, Pa., where he has been employed as assistant advertising manager since 1937. He is now serving a second term as president of Eastern Industrial Advertisers, Philadelphia, and is a director and chairman of the finance committee of the National Industrial Advertising Association. Mr. Collins served nearly five years with the U. S. Navy and is active in several Naval Reserve organizations. He is currently on the staff of the Organized Reserve at the U. S. Naval Base in Philadelphia with the rank of commander and is a member of the U. S. Naval Institute and U. S. Power Squadrons. A native of East Orange, N. J., he was graduated in 1929 from Williams College, Williamstown, Mass., and has attended the Universities of Grenoble in France and Heidelberg in Germany. He was adviser to the U. S. Delegation at the Fifth International Conference on Public Instruction at Geneva, Switzerland. Mr. Collins is a member of Phi Beta Kappa and Beta Theta Pi Fraternities.

THE *Fluidyne* PEERLESS Centrifugal PUMPS

THE VERSATILE SMALL PUMP FOR GENERAL SERVICES

The amazing Flexibility and Compact Construction of the FLUIDYNE makes it the Ideal Pump for Adaptation to your Equipment or System.



Type PE Integral Electric Drive Pumps

1 to 20 HP

Capacities: 20 to 1000 GPM • Heads: 20 to 270 ft.

For economy, durability and wide utility in a variety of liquid pumping applications. Peerless FLUIDYNE Type PE (electric drive unit) or the Type PB (V-belt or flat belt drive unit) are designed for vertical, horizontal or intermediate angle installation, with consistent and dependable high efficiency operation.

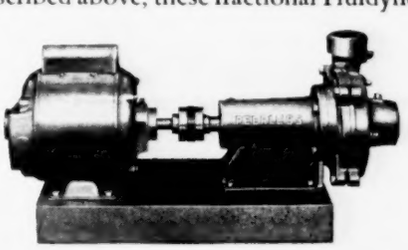
Request Bulletin No. B-165

Fluidyne Fractional HP Pumps

¼ to 1 HP

Capacities: 10 to 50 GPM • Heads: 20 to 95 ft.

Possessing all characteristics of the Types PE and PB pumps described above, these fractional Fluidyne Peerless



Pumps may be coupled to any standard stock motor for incorporation into any system requiring forced liquid circulation. All Fluidyne pumps are of end suction, single stage design with vertical split casing joint, and embody a host of features for ease of accessibility and maintenance.

Request Bulletins B-150 and B-151

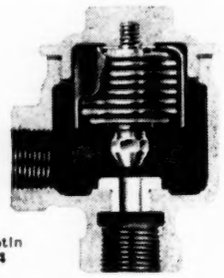
fmc PEERLESS PUMPS

PEERLESS PUMP DIVISION

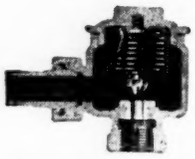
Food Machinery Corporation

Factories: Indianapolis, Ind.; Quincy, Ill.; Los Angeles 31, Calif.
District Offices: Chicago 40, Ill., 4554 No. Broadway; Philadelphia: Suburban Square, Ardmore, Pa.; Atlanta: Rutland Bldg., Decatur, Ga.; Dallas 1, Texas; Fresno, Calif.; Los Angeles 31, Calif.

How to Keep Equipment FULL of Live Steam . . .



Bulletin 544

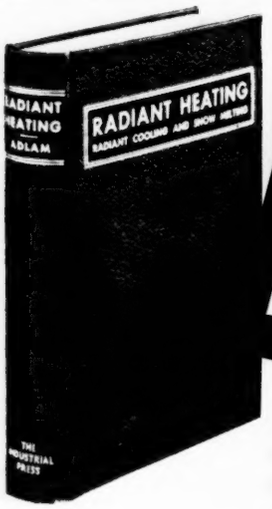


Prompt and full drainage of condensate and venting of air and noncondensible gases are among the most important factors in maintaining maximum heat in coils, kettles, etc. Two reasons why Nicholson thermostatic traps prove superior in test after test: (1) operate on lowest temperature differential, 5° to 15°, depending on trap size and steam pressure. (2) 2 to 6 times average drainage capacity. We'll gladly send one for testing.

5 TYPES FOR EVERY APPLICATION—heat, power, process; size ¼" to 2"; pressure to 225 lbs. Bulletin 544 or see Sweet's.

W. H. NICHOLSON & CO., 199 OREGON STREET WILKES-BARRE, PA.

Valves ★ Traps ★ Steam Specialties



Answering Your Questions About RADIANT HEATING

Architects
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Contractors
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466 Pages
309 Illustrations

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Here are the basic principles, the experience-proved facts, the practical working data on applications of radiant energy for heating and cooling, and embedded pipe for snow removal. Everyone interested in this heating method will find the answers to his questions in this thorough treatise. Covering every phase of the subject, from first principles to actual step-by-step design and installation procedure, this volume is a dependable manual of ready-to-use information on a timely and important subject.

THE INDUSTRIAL PRESS
148 Lafayette Street • New York 13, N. Y.

Louis F. Hudepohl, treasurer of the **Heating, Piping and Air Conditioning Contractors National Association,** died on December 24, after a short illness. He was president of T. J. Conner, Inc., heating and air conditioning contractors of Cincinnati. Mr. Hudepohl was very active in both local and national contractors associations. In 1947 he served as chairman of the national convention program committee. He had been a director of the national association since 1939 and was serving a second term as treasurer at the time of his death. He was also a director of the Allied Construction Industries of Cincinnati. Mr. Hudepohl was a prominent Democrat and was an active member of the Duckworth Club, Eagles, Elks, Redmen, Cuvier Press Club and the Clovenook Country Club.

Election of **Philip S. Morris** as vice-president in charge of advertising, purchasing and credit, **McQuay, Inc.,** and appointment of **H. Blake Thomas** as the firm's general sales manager, have been announced. Mr. Thomas, formerly assistant sales manager, succeeds R. C. Colman who is retiring after 15 years' association with the air conditioning and refrigeration manufacturing firm. Mr. Colman will remain a vice-president and member of the board of directors. Mr. Morris, who joined the company a year ago as

P. S. Morris

H. B. Thomas

assistant to the president, formerly was executive vice-president of McQuay Aircraft Corp. and Plxweve Manufacturing Corp., both of Los Angeles. He was one of the organizers and president of the Blue Moon Cheese Products Co., now located at Thorpe, Wis. Mr. Thomas returned to this country in the fall of 1946 from England where he served during the war as general sales manager of Chronomatic Corp., manufacturers of time control equipment. **D. F. Coones,** controller, who joined the company five years ago, was named assistant secretary.

Appointment of **James C. Bjorkholm** to the position of Advertising manager of the **Foil Division, Reynolds Metals Co.,** has been announced by company officials. Formerly advertising copy chief of the Aluminum Division of Reynolds in Louisville, Mr. Bjorkholm will transfer to the Foil Division headquarters in Richmond, Va. Mr. Bjorkholm has been associated with Reynolds for three years. Prior to his connection with Reynolds, Mr. Bjorkholm held the position of advertising coordinator for the Delta Manufacturing Co., in Milwaukee, Wis. Before the war, he held advertising positions with the Heil Co., Milwaukee; Perfex Corp., Milwaukee; and the Hoffman & York Advertising Agency of the same city.

Establishment of a Department of Welding Engineering, the first of its kind in the nation, has been announced at **Ohio State University.** In the College of Engineering at the University, the new department will offer undergraduate work leading to the degree of Bachelor of Welding Engineering and advanced study for graduate engineers. Ohio State's College of Engineering has offered a curriculum in this field for some nine years, as a division of the Department of Industrial Engineering.

The appointment of **Robert B. Cherry, Jr.** as southeastern regional sales director of **The Typhoon Air Conditioning Co., Inc.**, Brook'yn, N. Y. has been announced. Formerly with the Gas Air Conditioning Division of Servel, Mr. Cherry will supervise Typhoon representation in the states of Florida, Georgia, Louisiana, Mississippi and South Carolina. He will make his headquarters in Atlanta, Ga.

Paul H. Maurer, former executive engineer of **Redmond Co., Inc.**, Owosso, Michigan, has returned to the company after a three-year absence to assume the newly-created post of director of engineering, in which he will be in charge of all engineering work in the company, including research, development and product engineering, it was announced recently.

General Electric has named **Bartley Whiteside** as manager of community and employee relations for its Air Conditioning Department. Mr. Whiteside's community and employee relations responsibilities will include the plant cities of Ft. Wayne, Ind., Bowling Green, Ky., and Bloomfield, N. J., where his headquarters will be located.

The appointment of **Harold R. Mays** of Salt Lake City, Utah, as district representative of the Coal Heating Service Division, has been announced by J. Nelson Stuart, manager, Coal Heating Service Division, **National Coal Association**, Washington, D. C. With headquarters at Salt Lake City, Harold Mays will represent the division in the territory west of the eastern boundaries of Montana, Wyoming, Colorado, and New Mexico, and will work under the direction of Paul D. Hess, regional manager, whose headquarters are at Kansas City, Missouri.

Calumet and Hecla Consolidated Copper Co. announces the election of three vice-presidents. They are **A. E. Petermann**, general counsel, **H. Y. Bassett**, general manager of the Wolverine Tube Division, and **A. H. Wohlrab**, general manager of the Calumet Division. Robert Livermore of Boston has retired as vice-president but will remain as a director.

The **A. S. Nugent Co.** of Washington, D. C. will represent **Fitzgibbons Boiler Co.** in that area. In the Columbus, Ohio area, Fitzgibbons will be represented by **Lynn Co.** A new Fitzgibbons sales representative in Rochester, N. Y. is **R. Dudley Densmore.** He will concentrate on residential boiler sales.

Jones & Brown, Inc., Pittsburgh, has been appointed national distributor for the modulating Multi-Speed blower control manufactured by **National Thermal Drive Co., Inc.**, St. Paul, Minn.

On January 1, **Milcor Steel Co.**, fabricator of sheet metal building products and specialty items, changed its name to **Inland Steel Products Co.** Company spokesmen, in making the announcement, gave two reasons for the change. First, the new name gives a clearer picture of the firm's business, which is the fabrication of sheet metal products and not the production of steel. Second, the new name gives formal expression to the firm's relationship as a subsidiary of **Inland Steel Co.** Inland Steel Products Co. will continue to use the "Milcor" trade name to identify its products.

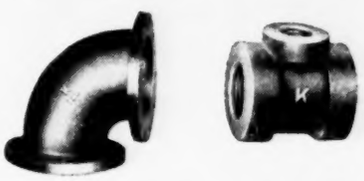
Three new district manager appointments in the midwestern and southern territories have been announced by **Duo-Therm Division** of **Motor Wheel Corp.** **R. C. Finney** has been named district manager for the states of Missouri, Kansas and Nebraska, **Ray Christman** for Florida and Georgia and **S. B. Baker** for the Michigan territory.

Sure, a steamfitter is happy when he finishes up a job that he's proud of.

The use of "K" fittings helps. They're machined true. They make up straight and tight. The threads and flanges fit.

It takes that kind of fittings to do a bang-up job. Makes the work easier, too.

"K" fittings are precision-cast, precision-machined, precision-inspected. Ask for them when you order fittings from your supplier.



HERE'S THE "K" LINE:

- Standard and Extra Heavy Cast-Iron Screwed Fittings
- Standard Flanged Cast Fittings
- Standard and Extra Heavy Companion Flanges
- Drainage Fittings

PRECISION FITTINGS

KUHNS BROTHERS CO.
DAYTON 1, OHIO

COMBINED SALES FACILITIES at Malleable Iron Fittings Co., Branford, Conn., and at Kuhns Bros. Co., Dayton, Ohio

Solve your Ventilating Problems with "INTERNATIONAL"

DUCT BOOSTERS
STACK FANS
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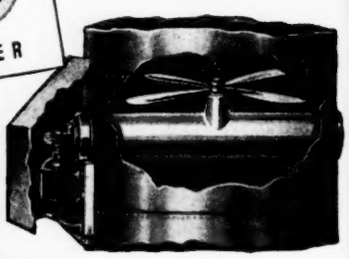
DUCT BOOSTER

If you have a problem of forced draft or ventilation, send for descriptive literature showing typical installations in ships and industrial plants, apartment houses and public buildings.

ASK FOR BULLETIN No. 99



STACK FAN

INTERNATIONAL ENGINEERING INC.
DAYTON 1, OHIO.
NEW YORK, 15 PARK ROW—CHICAGO, 407 S. DEARBORN

New "Packaged" Roth Condensate Return Units Offer Greater Flexibility!

Meet most demands . . . simplify installations . . . save space . . . and assure efficient, economical, service-free performance. Roth pump design simplicity and precision construction insure longer service, lower fuel costs. Capacities range up to 17,000 sq. ft. E.D.R., pressures up to 100 lbs. Also available for boiler feed service. Knockdown units for conversion to boiler feed or return service. Ask for Data Sheets 201 and 202.

Send for price, data sheets, discounts.

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COMING EVENTS

APRIL 5-8, 1948—Annual convention and exposition of the Oil Heat Institute of America, Coliseum, Chicago. Secretary, C. F. Curtin, 6 East 39th St., New York 16, N. Y.

APRIL 7-9, 1948—Tenth annual Midwest Power Conference, sponsored by Illinois Institute of Technology, at Sheraton Hotel, Chicago, Ill. Dean Stanton E. Winston, director, 3300 So. Federal St., Chicago 16, Ill.

MAY 3-7, 1948 — 1948 convention and foundry show of American Foundrymen's Association, Philadelphia Convention Hall and Commercial Museum, Philadelphia, Pa. Alfred A. Hilbron, Hotel Sherman, Chicago, Ill.

MAY 18-21, 1948—39th annual meeting of National District Heating Association, Hotel Statler, St. Louis, Mo. Secretary, John F. Collins, Jr., 827 N. Euclid Avenue, Pittsburgh 6, Pa.

MAY 24-27, 1948—66th convention and exposition of the National Association of Master Plumbers, Philadelphia Convention Hall, Philadelphia, Pa. Association office 1105 K St., N.W., Washington 5, D. C.

MAY 31-JUNE 2, 1948—Spring meeting, American Society of Refrigerating Engineers, New Ocean House, Swampscott, Mass. Secretary, M. C. Turpin, 40 W. 40th St., New York 18, N. Y.

JUNE 1-5, 1948—Annual meeting, Heating, Piping and Air Conditioning Contractors National Association, Hotel William Penn, Pittsburgh, Pa. Secretary, Joseph C. Fitts, 1250 Avenue of the Americas, New York, N. Y.

JUNE 20-24, 1948—Spring meeting, American Society of Heating and Ventilating Engineers, Mt. Washington Hotel, Bretton Woods, N. H. Secretary, A. V. Hutchinson, 51 Madison Ave., New York, N. Y.

JUNE 29-30, 1948—Mid-year convention, National Warm Air Heating and Air Conditioning Association, Edgewater Beach Hotel, Chicago, Ill. Managing director, George Boeddener, 145 Public Square, Cleveland 14, Ohio.

SEPTEMBER 13-17, 1948 — Third Instrument Conference and Exhibit, Convention Hall, Philadelphia, Pa. E. J. Grace, Jr., general chairman, Instrument Society of America, 1117 Wolfendale St., Pittsburgh 12, Pa.

DECEMBER 9-11, 1948—Annual convention, American Society of Refrigerating Engineers, Hotel Statler, Washington, D. C. Secretary, M. C. Turpin, 40 W. 40th St., New York 18, N. Y.

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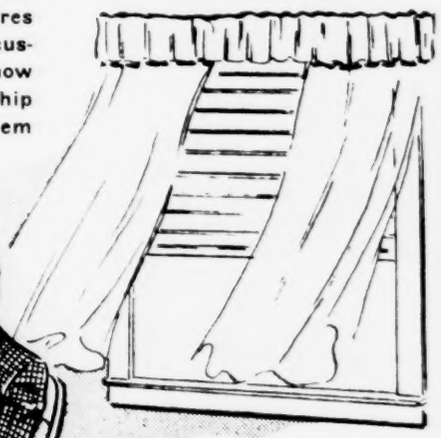

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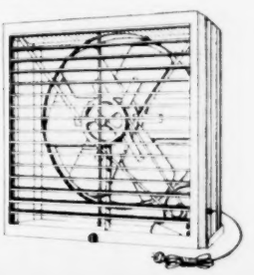

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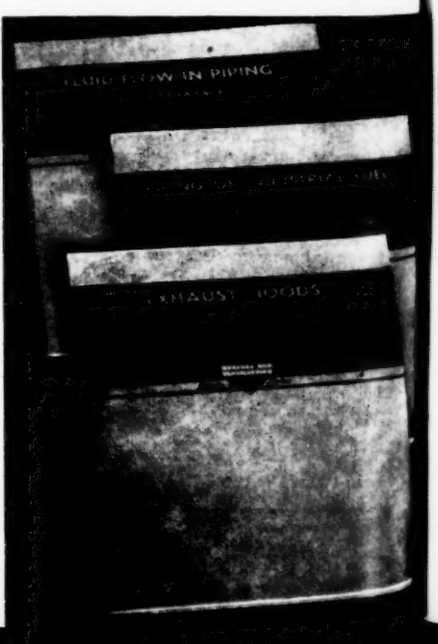

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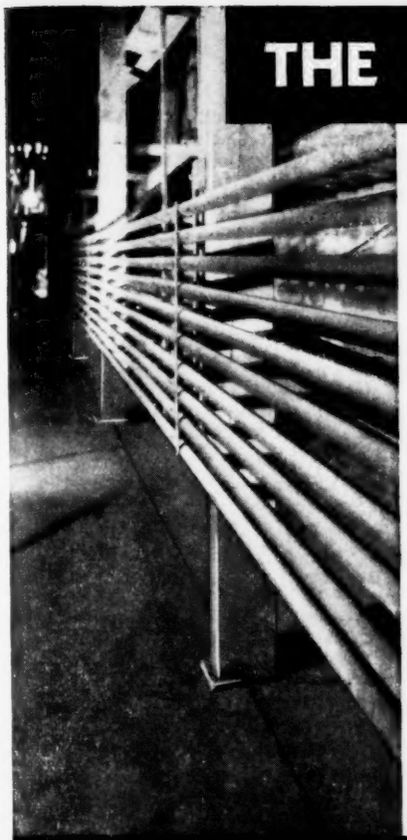

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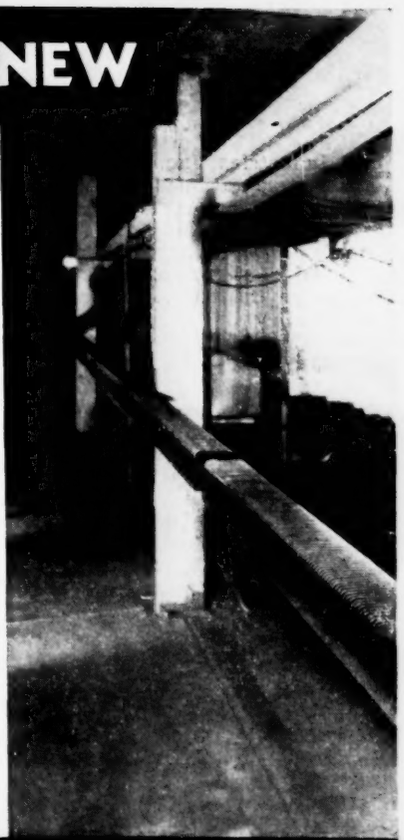

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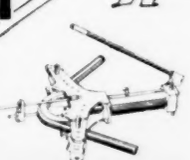

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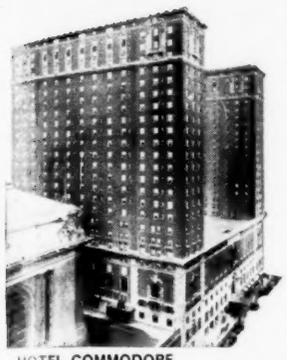

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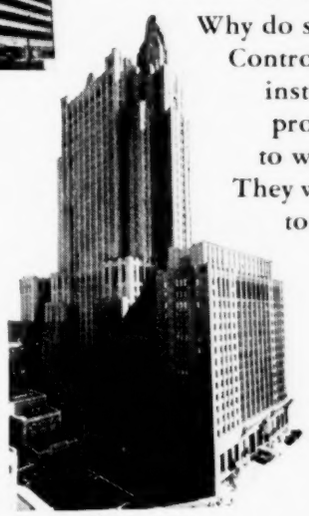

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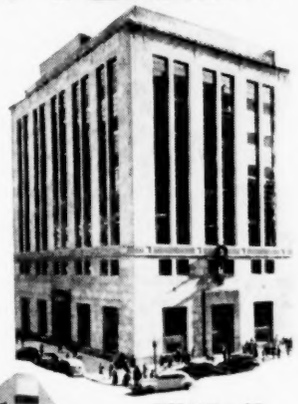

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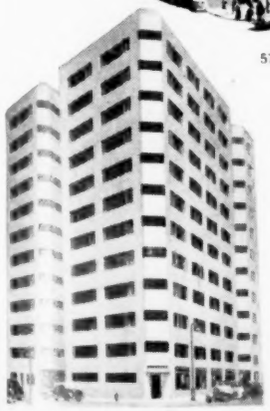

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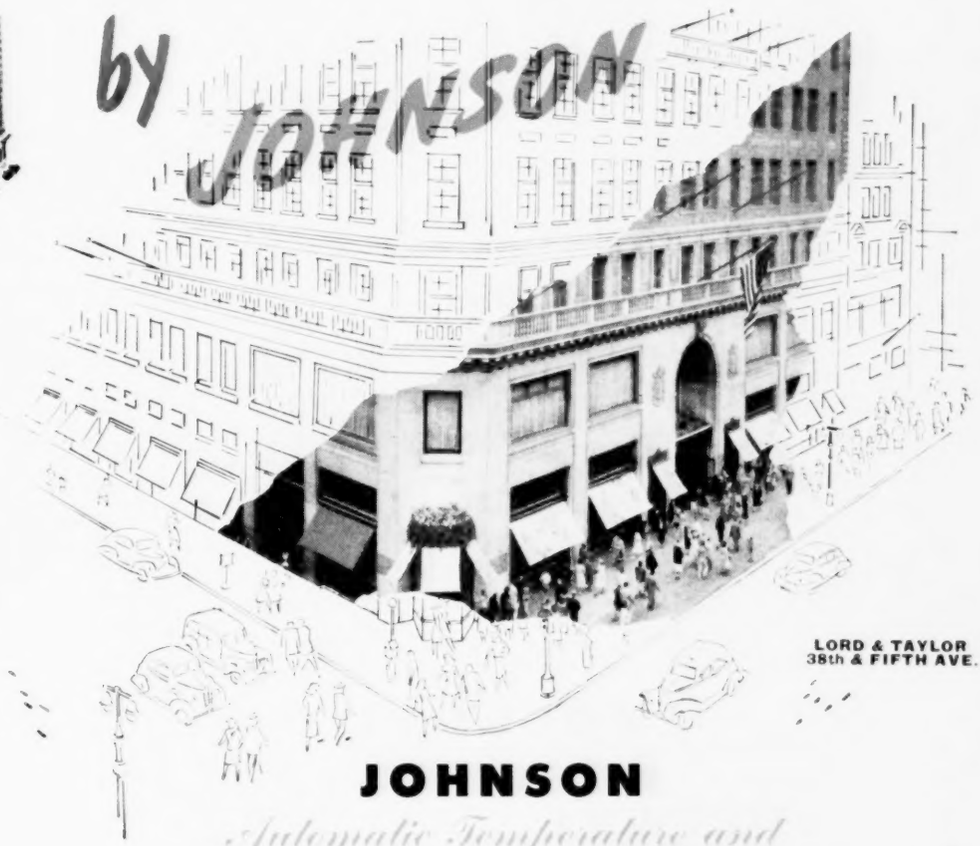

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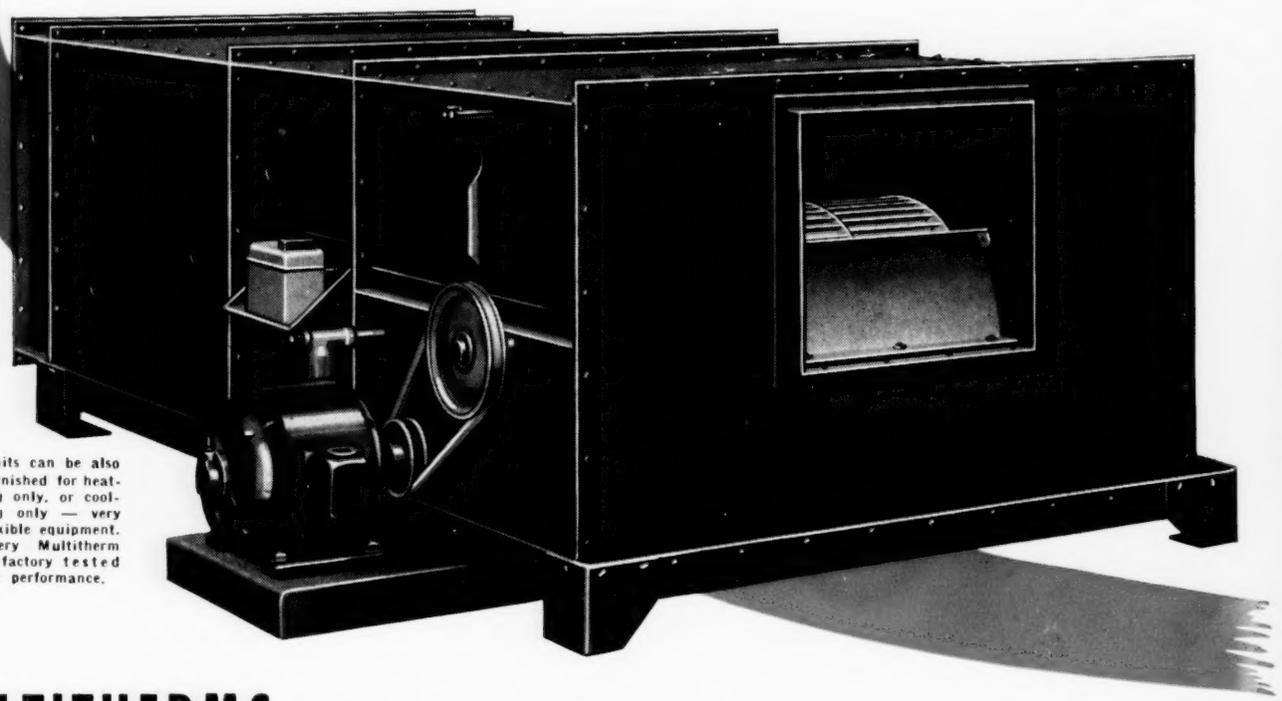

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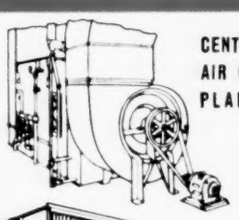

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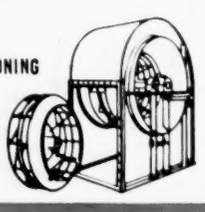
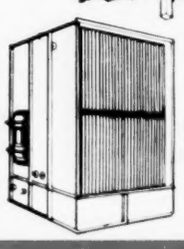
AIR CONDITIONING AND VENTILATING FANS





AIR WASHERS

CLARAGE FAN COMPANY
Kalamazoo, Michigan

APPLICATION ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

EC NOLOGY DEPARTMENT

MARCH, 1948

HEATING AND VENTILATING

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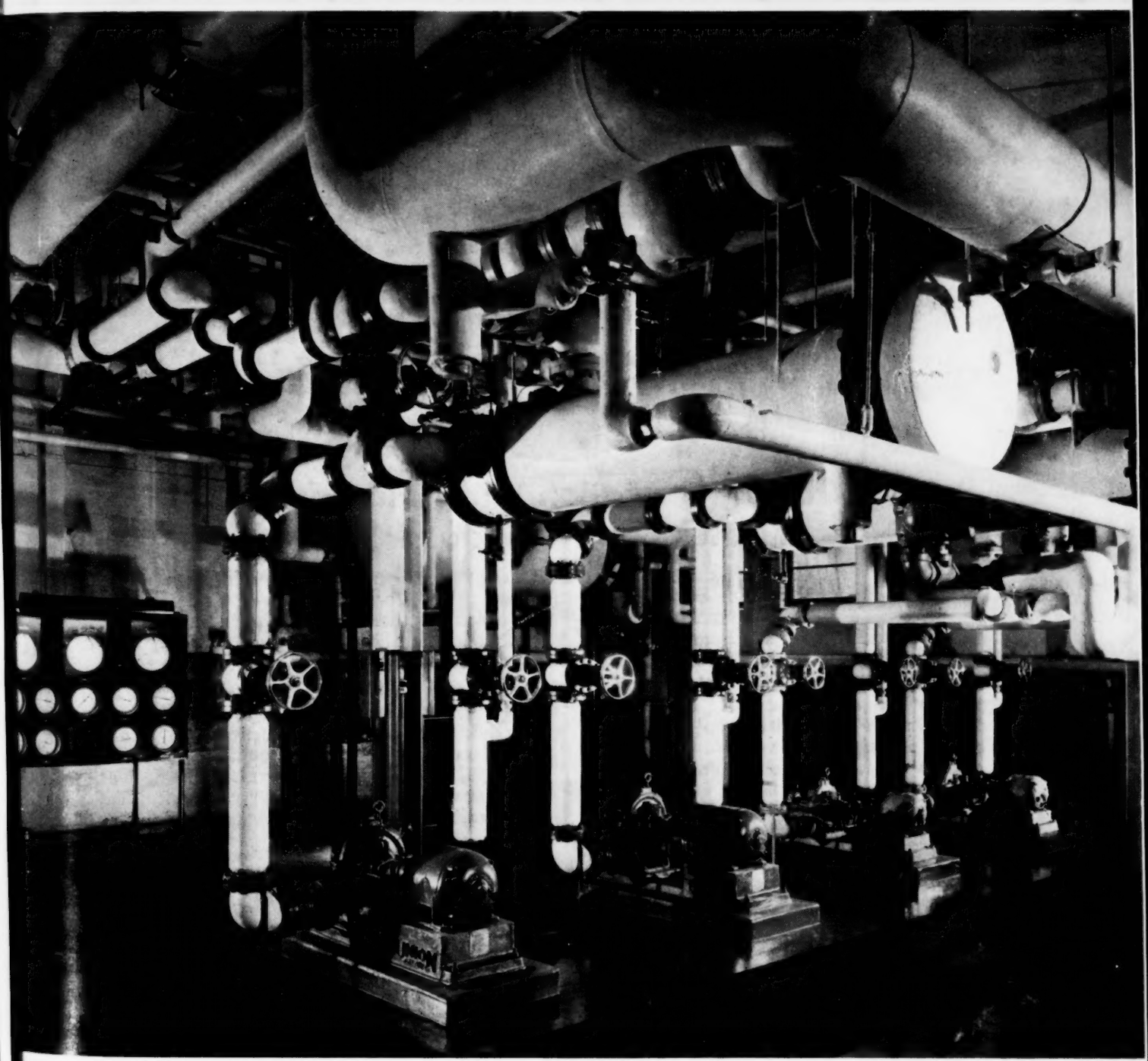
INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION



Hot water heating circulating lines and control valves installed in a large office building.

Design Details of Valves . page 77

Air Conditioning Systems for Tall Buildings . . . page 91

Pipe-to-Ground Heat Transfer . . . page 87

When to Use Simple Ventilation . page 84

RIC-WIL *Prefabrication* CUTS TIME AND COST of Piping Installations

Saved 7 field welds here

Saved 9 field welds here

Factory Insulation and Assembly Eliminates Costly Work at Job Site

● Specifying Ric-wiL Prefabricated Insulated Piping for underground, surface or overhead steam lines assures a permanent, efficient, trouble free system requiring only a minimum of field installation time and cost.

Combining flexibility and structural strength in design that makes them shockproof and durable, Ric-wiL Units are delivered to project sites in standard 21 foot lengths, in single or multiple pipe combinations, ready for immediate, single handling installation. Completely prefabricated, insulated and presealed at the factory, they are custom built to meet the individual specifications of any type of project requiring distribution piping between buildings.

With pipes and insulation supported in helically corrugated 16 gauge galvanized iron conduit, units are full seam welded, pressure tight, and protected by heavy coatings of asphalt and a tension wrapping of asphalt saturated felt. Conduit ends are pre-sealed to protect insulation at all times regardless of water conditions encountered.

Pipes can be turned easily in the conduit so that all field welding can be done from top position. Smooth iron collars, welded to conduit ends to match couplers, facilitate field coupling of units.

Because of their inherent strength and semi-rigid construction Ric-wiL Units for underground installations require only narrow trench with 18" ground cover under normal conditions, minimizing excavation and back fill.

Overall costs can be accurately predetermined and one order will cover every piping requirement. In addition to straight run units Ric-wiL also supplies a full line of expansion devices, anchors, fittings, drip legs, valve connectors and all other accessories needed for fast economical field installation of a complete system.

Send for Form 4626, Specification Data on Ric-wiL Prefabricated Insulated Pipe Units. Write: The Ric-wiL Co., Cleveland, Ohio, Department 183.

RIC-WIL

INSULATED PIPE CONDUIT SYSTEM

THE RIC-WIL COMPANY • CLEVELAND, OHIO

CABLE ADDRESS: RICWIL, BENTLEY'S CODE

2 KNOCKOUT BLOWS

at winter with BYERS Wrought Iron Pipe

Two important modern developments were incorporated in Bennett Motor Company, automobile agency at Salt Lake City, Utah. The architects, Young and Hansen, utilized radiant heating to warm the structure, and a snow melting system to keep the driveway clear. Byers Wrought Iron pipe was used for both jobs, which were designed by Paul O. Huber and Rushby C. Midgley, engineers. A. H. Walsh Plumbing Company, the heating contractor, fabricated the coils.

INSTALLATION DETAILS

Grids were made from Byers 1¼-inch Wrought Iron pipe. The "herringbone" arrangement in the service-repair garage, clears pits and floor islands. Six individual grids were used to permit "zoning." Hot water supplied by a Pacific oil-fired boiler is circulated by Bell & Gossett pumps. Fulton Sylphon controls govern operation.

Sinuous coils were used in the snow melting system. Hot water is circulated through these coils as soon as snow or sleet appears, keeping driveway and sidewalk clear.

SOLVES DIFFICULT PROBLEM

Radiant heating has won wide acceptance for garage heating. It eliminates cold floors . . . and any snow or wet "tracked in" by cars is speedily evaporated. Further, the effect of drafts from frequently-opened doors is minimized. Snow melting is receiving an equally warm welcome because of its demonstrated effectiveness.

ENGINEERING APPROVAL

Wrought iron pipe offers an unusual combination of advantages for installations like these. It is easily formed and welded . . . it has high heat emission . . . it expands and contracts at equal rates with concrete and plaster . . . and it had proved its corrosion resistance in all types of applications.

WANT MORE INFORMATION?

You'll find full information in our bulletin, "Byers Wrought Iron for Radiant Heating". Ask for it.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, Seattle, San Francisco. Export Division: New York, N.Y.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

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GENUINE WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS